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CONTENTS

PAGE

I. IS THERE A BIOLOGICAL LAW OF HUMAN POPULATION GROWTH? - - - - - - - - *A. B. Wolfe* 557

II. THE AMERICAN RICE-GROWING INDUSTRY: A STUDY OF COMPARATIVE ADVANTAGES *A. H. Cole* 595

III. THE GOLD-EXCHANGE STANDARD *J. Laurence Laughlin* 644

IV. GERMANY'S FOREIGN TRADE TERMS IN 1899–1913 *N. Molodowsky* 664

V. THE COPPER MINING INDUSTRY IN THE UNITED STATES, 1889–1925. II. INDUSTRIAL ORGANIZATION - - - - - - - - - - - *F. E. Richter* 684

VI. TAWNEY'S RELIGION AND CAPITALISM, AND EIGHTEENTH-CENTURY LIBERALISM *Overton H. Taylor* 718

NOTES AND DISCUSSIONS:

Christmas Clubs - - - - - - *Lloyd M. Crosgrave* 732

New Evidence on the Shipping and Imports of London, 1601–1602 - - - - - - - *Lewis Rex Miller* 740

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CONTENTS FOR MAY, 1927

I. THE EVOLUTION OF PAPER MONEY IN ENGLAND . . R. D. Richard
II. SOME POSITIVE CONTRIBUTIONS TO THE INSTITUTIONAL CONCEPT . . . . . Lionel D. Edi
III. COMMERCIAL POLICY IN POST WAR EUROPE: RECIPROCITY VERSUS MOST-FAVOURED-NATION TREATMENT . H. Van V. Fa
IV. THE MONETARY THEORY OF THE TRADE CYCLE AND ITS STATISTICAL TEST . . . . . R. G. Hawtre
V. LABOR PROBLEMS AS TREATED BY AMERICAN ECONOMISTS Charles E. Person

REVIEW:

Recent Literature on the Origins of Modern Capitalism . . M. M. Knigh

NOTES AND DISCUSSIONS:

The Influence of Agricultural Machinery and the Automobile on Farming Operations . . . . . H. W. Pec
Arthur Young on English Roads . . . . . Edwin F. Ga

CONTENTS FOR FEBRUARY, 1927

I. DEPRECIATION AND VALUATION FOR RATE CONTROL . J. C. Bonbrigh
II WHAT DO "STATISTICAL DEMAND" CURVES SHOW? . E. J. Workin
III. THE COPPER-MINING INDUSTRY IN THE UNITED STATES 1845-1925 . . . . . F. E. Richte
IV. UTILITY CURVES, TOTAL UTILITY, AND CONSUMER'S SURPLUS . . . . . Harry E. Mille
V. THE INFLUENCE OF THE ANGLO-FRENCH TREATY OF COMMERCE OF 1860 ON THE DEVELOPMENT OF THE IRON INDUSTRY IN FRANCE . . . . . Arthur Louis Dunha

REVIEW:

Esslen's Politik Des Auswärtigen Handels . . . . F. W. Taussi

NOTES:

Depreciation and Production Cost . . . . . Allyn A. Youn
The Distribution Equilibrium under the Specific Productivity Theory . . . . . Noel Mors
Sinking Fund and Cost: Criticism of Bye's Analysis . . . Willard C. Beatt

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THE
QUARTERLY JOURNAL
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AUGUST, 1927

IS THERE A BIOLOGICAL LAW OF HUMAN POPULATION GROWTH?

SUMMARY

The work of Pearl and Reed, 558 — Their postulates, 559. — The logistic formula, 561. — The question of closeness of fit of the formula to the observed data, 562. — The applications of a mathematical formula of growth, 564. — Intercensal interpolation, 564. — Prediction of future growth, 566. — Malthus, 568. — Elkanah Watson, 569. — Department of Agriculture experts, 570. — Pritchett, 571. — Critique of Pearl's assumptions and of his formula as a predictive device, 573. — Cultural influences and cycles of growth, 577. — Empirical versus rational laws, 579. — The use and abuse of analogy, 582. — The analogy between the growth of an individual and that of an aggregate, 583. — Relation of changing birth rates, death rates, and age constitution to the shape of the growth curve, 586. — The Algerian population, 587. — Inconclusiveness of Pearl's analysis, 589. — Further analogy — correlation of population growth with density, 590. — Doubtful value of the logistic formula, 593.

OUTSTANDING among American biologists who have recently concerned themselves with the problem of the quantity of population are Professor E. M. East, of the Bussey Institution, Harvard University, and Raymond Pearl, Professor of Biometry and Vital Statistics, Johns Hopkins University.[1] A biometrician and former student of Karl Pearson, Pearl has doubtless long had

1. East's work on population, known through his popular volume, Mankind at the Crossroads (1923), calls for no comment here, since he treats the subject non-mathematically and since he also accepts Pearl's "logistic" law of population growth with but slight reservation.

a scientific interest in population. This interest was probably intensified by his work as head of the statistical division of the United States Food Administration during the war. His appeal to biological analogies is perhaps the result of his early work in experimental genetics at the Maine Agricultural Experiment Station. Shortly after the war he and his coworker, Lowell J. Reed, took up the search for a mathematical formula of population growth which would not only give a curve closely fitting the observed census figures but would also reflect the fundamental forces determinative of rate of growth. In other words, the search was for a mathematical or statistical law which would not be merely empirical, but would give promise of being a rational law — one which would not only accurately describe actual population growth in particular cases, but also lead to discovery of the mechanism or causal steps (assumed by Pearl to be "biological") by which growth is what it is.

The first published statement of the result of the search was made in 1920.[2] Later followed other papers amplifying the presentation and making new applications.[3] In none of these, however, did Pearl and Reed venture to state what specific phenomena, biological or otherwise, might be correlated with the growth curve as causes of its peculiar form. While they were increasingly confident that the close fit obtained by their

2. Pearl and Reed, "On the rate of growth of the population of the United States since 1790 and its mathematical representation," Proceedings of the National Academy of Sciences, vi, 275–288.

3. The Biology of Death, 1922, pp. 247–256; "On the mathematical theory of population growth," Metron, iii (1923), 6–19; Predicted Growth of Population of New York and its Environs, Plan of New York and its Environs, Publication No. 4, 1923; "The probable error of certain constants of the population growth curve," American Journal of Hygiene, May, 1924; Studies in Human Biology, 1924, chap. 24, "The curve of population growth," chap. 25, "The growth of human population."

logistic [4] formula indicated that it was a rational law, based on causal relations, and not a mere empirical formula, they did not adduce any causal mechanism which would remove the odor of empiricism. This step, however, Pearl felt able to take, tentatively to be sure, in 1925, after an analysis of the population growth of Algeria.[5]

In instituting their search, Pearl and Reed posited certain "factors," namely, (1) finite limit of area; (2) upper limiting asymptote of population; (3) lower limiting asymptote of population (= 0); (4) cyclical character of population growth, successive cycles being cultural in origin, and additive; (5) general shape of the growth curve.[6]

Postulate (1) is necessary and rational, providing it be adhered to. For world population the finite area is the total land surface; but for a given country, over a long period of time, the idea of an area "with definite limits" does not hold, since additions and subtractions to a country's area may be neither infrequent nor unimportant. Pearl and Reed fit a logistic curve to United States census data, for instance, without any allowance whatever for the various territorial expansions from 1790 on. Possibly this is a permissible procedure, since it may be argued that the unsettled area was available for settlement from the start, whether it was under the sovereignty of the United States or not. Similar argument will not hold for countries like France, Italy, and Germany, which have experienced significant additions — or subtractions — of area and population within the periods covered by the census data used by Pearl and Reed. It can be argued that changes in area

4. This term was apparently first used by the Belgian mathematician, P. L. Verhurst. See below, p. 582, note 3.
5. The Biology of Population Growth. See below, p. 586.
6. Studies in Human Biology, pp. 567–569.

have no appreciable effect on the shape of the growth curve, only if we assume that population everywhere increases in accordance with the same law, and moreover is in the same stage of growth. The second postulate follows logically from the first, though it does not follow that we can fix with any degree of confidence the numerical value of the upper limit of growth.[7]

Postulate 3 is merely a convenient mathematical assumption. The significance of the fourth postulate will appear later.

With regard to the fifth postulate, the authors make the following observation:

> Within each cultural epoch or cycle . . . the rate of growth of population has not been constant in time. Instead, the following course of events has apparently occurred generally, and indeed almost universally. At first the population grows slowly, but the rate constantly increases to a certain point where it, the *rate* of growth, reaches a maximum. . . . This point of maximum rate of growth is the point of inflection of the population growth curve. After that point is passed, the rate of growth becomes progressively slower, till finally the curve stretches along nearly horizontally, in close approach to the upper asymptote which belongs to the particular cultural epoch and area involved.[8]

Postulate 5 is thus derived from observation of specific cases. It is inductive and empirical. There is no obvious *a priori* reason for assuming universality for the mode of growth described.

The central assumption, however, on which Pearl and Reed's researches are based is the following:

> The rate of growth . . . is proportional to two things, namely: (*a*) The absolute amount of growth (or size) of population already attained; (*b*) the amount of as yet unutilized, or reserve, means or sources of subsistence still available in the area to support further population.[9]

7. Cf. G. H. Knibbs, "Laws of Growth of Population," Part I, Journal of the American Statistical Association (Dec., 1926), xxi, 382.

8. Studies in Human Biology, pp. 568, 569.

9. The Biology of Death, 1922, p. 248. The Biology of Population Growth, 1925, p. 22. These assumptions were probably suggested to

In effect this assumption is that the rate of growth is primarily a determinable and predictable function of density.

Reasoning from these postulates, Pearl and Reed, in their first paper,[1] took as a first approximation to the law expressing normal population growth

$$y = \frac{be^{ax}}{1 + ce^{ax}}$$

which made no attempt to cover cases in which successive cycles of growth appear. Later they hit upon the equation

$$y = \frac{b}{e^{-ax} + c}$$

as satisfying all the postulates above noted.[2]

After working out the mathematics of fitting the curve, and its probable errors, they proceeded to apply it to the census data of various countries and cities.[3] By this time, as is evidenced by the frequent citations of their theory in recent population literature, their conclusions, especially the prediction of 197,274,000 as the upper limit to the population of the United States, were widely known, by some accepted as a sort of fatalistic

Pearl by the researches of Robertson and other physiologists into the rate of growth of individual organisms. The second assumption, for instance, is the avowed hypothesis of E. A. Mitscherlich, the Königsberg soil expert, whose remarkable experiments in plant yields and mathematical formulation of the law of diminishing returns have recently been brought to the attention of American readers by Spillman (Spillman and Lang, The Law of Diminishing Returns, 1924, pp. 10, 104).

1. "On the rate of growth of the population of the United States since 1790 and its mathematical representation," Proceedings of the National Academy of Sciences, 1920, vi, 275–288.

2. Studies in Human Biology, 1924, pp. 569 ff.

3. Ibid., chap. 25. Also, Pearl and Reed, Predicted Growth of Population of New York and Environs, 1923.

law somehow distilled by the alchemy of mathematics, by others hailed as proof that the Malthusian theory of population has been exploded and that we need not fear over-population.[4]

Pearl holds that "the first thing obviously needed in any scientific approach to the problem of population is a proper mathematical determination and expression of the law of population growth." [5] This sweeping assertion might be questioned from more than one angle. It assumes flatly that there *is* a law of growth, presumably universal. If we mean by this that population growth is governed by certain causes or conditions, — be they simple or complex, known or unknown, — the assumption is reasonable; but if we mean to imply that population always actually grows with a regularity and certainty describable by a simple mathematical equation, — for instance, a logarithmic curve, — we are on unsafe ground. It would seem that the first thing needed is to test the assumption that population growth, and, specifically, changes in the rate of growth, take place with sufficient regularity to give to a mathematical formula any significant degree of reliability. One test of this — but not a conclusive one — is whether a given formula accurately fits the known census data.

We are thus brought at the outset to the question whether the logistic curve fits the observed growth better than some other type of curve. We have also the question whether Pearl and Reed have employed proper

4. On the basis of his earlier papers on the subject, Pearl must be absolved from any such thought; but in his latest work he expressed himself in a manner that might lend color to it. Cf. "The population problem," Geographical Review, Oct., 1922, pp. 636–645 (reprinted as chapter 21 in Studies in Human Biology), in which he compares the rate of population growth with the trend of food production; also The Biology of Population Growth, 1925, pp. 210–213.

5. The Biology of Death, p. 247.

mathematical methods in fitting their curves. On both counts they have been adversely criticized. Bowley, for instance, states:

> For England and for France I find that an ordinary quadratic parabola (fitted by the method of least squares) gives figures almost identical with the logistic curve — for France even rather closer figures. For the United States I used a cubic parabola and obtained a smaller maximum error, a greater mean error, and nearly the same error of mean square, as given by the logistic equation. Thus on the test of goodness of fit alone, the logistic equation has no special claims, so far as representation of the past records is concerned.[6]

Knibbs, in a penetrating analysis, has shown that "some part of a logistic curve can readily be drawn through many series of results, in such a way that individual deviations shall be at a minimum," and that the fitting power of a curve, therefore, does not constitute proof of the theory on which the curve is based.[7] He proves that the changes in the rate of growth of the population of the United States, 1790 to 1920, do not conform to the logistic hypothesis.[8] For Australia, England, and Wales and a group of Occidental countries, he thinks that other formulas, for example, a parabola, or a parabola plus a straight line, fit the census data better than does the logistic curve.[9] For France, the population of which is in a late stage of its growth curve, he finds that from 1886 to 1911 the quinquennial percentages of increase were 0.44, 0.44, 1.09, 0.77, 0.92, which generally are increasing, instead of diminishing as would be demanded by the logistic formula.[1] Wilson and Luyten find

6. Journal of the Royal Statistical Society (Jan., 1925), lxxxviii, 77. Edgeworth (ibid., p. 59) confesses that he has made trial of other formulas to see whether they fit the facts as well as does the logistic, but "without success."

7. "The laws of growth of a population," Journal of the American Statistical Association (Dec., 1926), xxi, 387, 397.

8. Ibid., pp. 387–391.

9. Ibid., pp. 393–397.

1. Ibid., p. 392.

the Pearl-Reed formulas unsatisfactory in several respects, especially in fitting power. Specifically, they suggest that Pearl and Reed have erred in fitting their curves, because in using the method of least squares they have taken absolute rather than percentage deviations.[2] Whereas Pearl and Reed find an upper limit of 35,000,000 for the population of greater New York City, Wilson and Luyten, using the Pearl–Reed formula but employing percentage instead of absolute deviations, arrive at an upper limit of 17,000,000. Wilson and Luyten also bring out the fact that the Pearl-Reed curves, when applied to different parts of a population (as of New York City and the rest of New York State), fail to satisfy the logical condition of additivity, and hence may well make the limiting population of a part greater than that of the whole.[3] So far as the present writer knows, Pearl and Reed have made no reply to these criticisms.

Leaving these technical questions to the mathematicians, we may pertinently ask what uses a mathematical formula of population growth may serve. The most obvious application is to the problem of estimating the population at any intercensal date. Such interpolations for intercensal years are necessary wherever annual birth, death, and marriage rates are to be calculated. The second application lies in the prediction of future population, and in estimating what the population was at any given time prior to the first census enumeration. The third value of empirical mathematical formulas lies in the fact that they may stimulate research into the causes of the varying rates of increase. We shall consider these matters in order.

Pearl and Reed were led to the logistic curve through

2. "The population of New York City and its Environs," Proceedings of the National Academy of Sciences (Feb., 1925), xi, 137–143.

3. Ibid., p. 139.

dissatisfaction with formulas that previous statisticians had employed in intercensal interpolation.[4] To the formulas that had been used, especially Pritchett's third order parabola, they found two objections. First, the fit of the curve to the census figures was not satisfyingly accurate; second, while the parabolic formula might do for limited periods, it leads to absurdly large populations when extended a few decades into the future.

Meticulous closeness of fit is more important to the theorist, however, than to the practical statistician. Hitherto the United States Census Bureau has calculated population for intercensal years on the simple assumption of arithmetical increase. Theoretically a geometrical rate should more nearly represent the probable growth. But for the country as a whole (though not for cities subject to sudden changes in rate of growth) the census officials have found that the arithmetical assumption gives all the accuracy practicable. It is true, of course, that a sudden disturbance of normal conditions, such as was caused by the World War and the cessation of immigration, may cause estimates based on the arithmetical assumption to vary far from the facts.[5] But this difficulty would have to be met by any other formula also.

All vital statistics rates for intercensal years, save infant-mortality rates, are calculated on estimated pop-

4. "On the Rate of Growth of the Population of the United States since 1790." Proceedings of the National Academy of Sciences (1920), vi, 275–288.

5. Cf. Newsholme, Vital Statistics, 1923, pp. 40–47. E. C. Snow, "The application of the method of multiple correlation to the estimate of post-censal population," Journal of the Royal Statistical Society (May, 1911), lxxiv, 575–629. F. R. Belcher, "A method of estimating the population of continental United States for intercensal years," Quarterly Publications of the American Statistical Association (Dec., 1921), xvii, 994–998. T. E. Hayward, "On the different methods available for calculating mean numbers of population for the ten calendar years most nearly corresponding to an intercensal period," Journal of the Royal Statistical Society (Sept., 1901), lxiv, 434–444.

ulations. Extreme accuracy in birth rates and death rates would consequently require not only better registration (especially of births) than we have now, but a precise method of calculating the population in any given intercensal year. In view, however, of the deficiencies in registration and the chances of error in the monumental task of enumerating the actual population in a census year, especially the probability of deficiency in enumeration, it is highly probable that Pearl's logistic method of intercensal interpolation would give a precision to large degree illusory.

The second matter for consideration is the use of mathematical curves to predict future population and to reconstruct pre-census populations. Both of these procedures involve extrapolation, deservedly recognized by careful statisticians as a dangerous process. The population, either before the first census or after the latest, is calculated from the equation of known growth. Such a calculation is based on the assumption that the same mathematical law that describes the known growth is the law in accordance with which population has grown in the past and will continue to grow in the future. Where the equation is purely empirical this assumption has slight ground. Where the formula can be demonstrated beyond reasonable doubt to be rational — that is, to reflect known causes, or mechanism, determining rate of growth — the validity of extrapolation is better established, but for a comparatively brief time interval only. Even for short periods, prediction or reconstruction could be wholly trustworthy only if the formula were complex enough to include all the changes in the significant variable causes which operate at different times. We have no such formula, and if we had, it would be so complex as to be practically unmanageable. Extrapolation based on the assump-

tion that the same causes will operate with constant intensity is practically certain to lead to erroneous predictions.

Estimates of pre-census populations have in the main only an academic interest. But there are many practical problems in business, engineering, and public administration, the effective meeting of which requires as accurate an estimate as can be made of future population. A business firm's policy of enlarging plant may depend upon the probabilities of growth of the population in the market area which it serves. The further development of irrigation projects should be conditioned on the future probable demand for agricultural products, which is in turn a function of population growth. Similar considerations apply to a city's policy of public utility expansion and to the layout of its thoroughfares to provide for population increase. In this country, where scientific city planning is still in its infancy and as yet taken seriously in but few places, our larger cities are paying dearly for the fact that in the past no one attempted to make administrative application of estimates of future growth. So far as planning thoroughfares for future traffic was concerned, municipalities acted as if they were oblivious to the very growth "prospects" of which their boosters were so naïvely proud.[6]

Prediction of population is a modern interest. Prior to the time of Malthus there were academic speculations and controversies (Montesquieu, Robert Wallace, Hume) over the relative populousness of ancient and

6. It is worthy of remark that, even had American cities had the services of predictive mathematical statisticians twenty-five years ago, they would probably now, nevertheless, be confronted with the problem of traffic congestion, since no mathematical formula would have been likely at that time to predict the 20,000,000 automobiles now in the country.

modern nations, but not much attention to probable future growth. Before the day of census-taking, political arithmeticians were occupied with estimating the actual population (Gregory King, Arthur Young, George Chalmers, Dr. Richard Price, the Rev. John Howlett). Perhaps the earliest attempt to estimate statistically the future population of England was that of Gregory King.[7] His prediction for 1800 was over six million, and that for 1900 over seven million, too small. In underestimating, at the end of the seventeenth century, the power of future growth, he was followed by others in the eighteenth and nineteenth centuries. Many of the opponents of Malthus, even after the technological changes brought in by the industrial revolution, which tremendously expanded world food production, had little conception either of actual rates or of potential power of growth.

Malthus can hardly be said to have stated a law descriptive of the manner and rate of actual population growth. His "principle" is stated with an "if." Where a population has room to expand, it will increase in geometrical ratio till abruptly stopped by limitation of subsistence, *unless* preventive checks reduce the birth rate. After population catches up with subsistence production, it can thereafter increase no faster than production increases. Were we to take Malthus's arithmetical rate of food increase literally, population could increase, after the point mentioned, by the addition of a definite absolute number, but no more, each year. But we cannot regard the idea of an arithmetical rate of food increase as anything but a crude way of expressing the fact that agricultural production is conditioned by the law of factoral proportion (diminishing returns) and by the rate of progress in agricultural technique, the re-

7. Natural and Political Observations and Conclusions upon the State and Condition of England, 1696.

sultant of which influences we cannot predict, further than that it cannot everywhere and always be increase of food at a geometrical rate.[8]

For the United States, certain predictions of future growth, other than that of Pearl and Reed, may be noted briefly. In 1815 an American traveler and publicist, Elkanah Watson, made his now famous prediction of future growth up to 1900.[9] Watson assumed that the rate of increase would remain practically constant up to 1900. Up to 1860, his estimates proved to be accurate to within less than one per cent. Thereafter, they were increasingly too high, until for 1900 his predicted population was 25 per cent greater than the actual population. Even for the decades up to and including 1860, however, the accuracy of prediction was in part accidental. His calculations were made before immigration had reached appreciable dimensions; consequently he thought he was predicting the natural or autogenous growth. But whereas the total immigration

8. Yule is correct in saying that Malthus's argument gives no information as to "the true form of the law of increase"; but he is not strictly accurate, from the standpoint of theory, when he says that the only conclusion that can be drawn from Malthus is that "population, confined to a specified area, does *not* increase in geometrical progression." ("The growth of population and the factors which control it," Journal of the Royal Statistical Society [Jan., 1925], lxxxviii, 3.) The example of the United States has shown that where the "specified area" (of usable land) is partly unpopulated, population can and does increase geometrically.

9. Men and Times of the Revolution, edited by his son W. C. Watson, 1856, pp. 455, 456. It is likely that Watson's estimates would have fallen into complete oblivion had they not been seized upon by Francis A. Walker to substantiate his contention that the decline in the native American birth rate was caused by immigration. Cf. J. R. Commons, Races and Immigrants in America, 1907, pp. 200, 201; Francis A. Walker "The great count of 1890," Forum (June, 1891), xi, 406–418; "Immigration and Degradation," (August, 1891), xi, 634–644; Discussions in Economics and Statistics, 1897, vol. ii. Walker's thesis is criticized by E. A. Goldenweiser, "Walker's theory of immigration," American Journal of Sociology (Nov., 1912), xviii, 342–351, and by M. R. Davie, "Immigration and the declining birth rate," Scientific Monthly, July, 1924, pp. 68–76.

up to 1820 was only about 250,000, between 1820 and 1860, 4,900,000 immigrants came in, and from 1860 to 1900, 14,100,000 more. Had the rate of increase of the native American stock continued to be the same as it was in 1810–1820, the actual population in 1860 would have been equal to Watson's figure plus the survivors and the surviving descendants of the nearly five million immigrants who were admitted from 1820 to 1860.

There have been many haphazard guesses, mostly based upon the assumption of the indefinite continuance of a constant rate of increase. There have been other predictions based upon the land available for agriculture and probable improvement in agricultural technique. James J. Hill, for instance, on the assumption of a natural increase of 15 per cent and an addition of 7,500,000 immigrants per decade, predicted populations of 117,000,000 by 1920, 142,000,000 by 1930, 171,000,000 by 1940, and 204,000,000 by 1950.[1]

Recent estimates of the agricultural limits of our population have been much more thoro in method and more conservative in conclusions. Thus, after a thoro survey of the known facts concerning our land area and its suitability for various uses, the experts of the United States Department of Agriculture conclude that we can ultimately support 300,000,000 people — at the pre-war German standard of living.[2] O. E. Baker ventures 250,000,000, "in accordance with our present tastes," and from 400,000,000 to 500,000,000 on "a largely vegetarian and dairy diet, so long as the supply of fertilizers held out."[3] East fixes the upper limit at

1. Highways of Progress, 1910, p. 5.

2. L. C. Gray, O. E. Baker, and others, The Utilization of our Lands for Crops, Pasture, and Forests; reprint from Year Book, 1923, no. 896, p. 499.

3. "Land utilization in the United States; geographical aspects of the problem," Geographical Review (Jan., 1923), xiii, 15.

331,000,000.[4] None of these estimates, however, affords any suggestion of a law of population growth.

Apparently the first American, after Watson, to attack the problem of prediction on the assumption of a mathematical law of increase was H. S. Pritchett.[5] He used a third order parabola, and obtained a fair fit to the actual populations up to 1890. His estimates for later decades have proved much too high.[6]

Pearl and Reed's first approximation to a more accurate empirical formula was the substitution of a logarithmic parabola, of the form $y = a + bx + cx^2 + d \log x$, which gives a better fit than Pritchett's equation, and which they regard as "entirely sufficient for all practical statistical purposes.[7] But for long-range prediction they reject this type of equation, because a curve corresponding to it never becomes asymptotic, altho in time it does flatten out. They propose instead their

4. Mankind at the Crossroads, 1923, p. 158.

5. "A formula for predicting the population of the United States," Quarterly Publications of the American Statistical Association (June, 1891), ii, 278–286; "The population of the United States during the next ten centuries," Popular Science Monthly (Nov., 1900), lviii, 49–53.

6. For similar method, cf. V. Pareto, Cours d'économie politique, 1896–97, i, 196 ff.; Traité sociologie générale, 1917, i, 33, 34.

Pritchett's formula, if future population growth conformed to it, would lead to the following populations in the United States:

1930	136,900,000	1800	296,008,000
1940	162,300,000	1900	339,200,000
1950	190,700,000	2000	385,900,000
1960	220,100,000	2100	1,112,900,000
1970	257,700,000	2500	11,856,300,000
		2900	40,852,300,000

The estimates made by the Department of Agriculture experts indicate that the figures up to A.D. 2000 are not inherently impossible, tho it is more than doubtful if they will be reached; but the figures beyond that are obviously absurd. A population of 40,852,300,000 in A.D. 2900, would mean a density of 11,000 per square mile. Cf., Pritchett, "The population of the United States during the next ten centuries," Popular Science Monthly (Nov., 1900), lviii, 49–53.

7. Studies in Human Biology, pp. 561–566.

generalized logistic equation. We might regard either the logarithmic parabola or the logistic curve as an improvement over Pritchett's parabolic hypothesis, simply because Pritchett's formula obviously leads to absurd results; but that is not to establish the logistic formula as the only, or even the best, one on which to predict growth. Since more than one type of curve may frequently be made to fit the data satisfactorily, it follows that no empirical formula can afford secure basis for prediction by extrapolation.[8] That the Pearl–Reed formula does not always fit, however, especially for a new country, Wilson and Luyten have shown. Attempting to apply the logistic equation to the population growth of Canada, they found the Canadian growth exhibiting an "explosive" accelerated rate, above the logistic curve.[9]

The somewhat disconcerting lack of agreement among mathematicians with regard to the relative accuracy of fit of different types of curve, in relation to the validity of these curves for predictive purposes, cannot but produce in the mind of the non-mathematical student grave doubt as to the validity of the whole idea of predicting population growth by the aid of symbolic logic applied to empirical data. Rather than attempt to follow these mathematical disputes, it will be more profitable here to examine critically the idea of population prediction in general and Pearl's predictions in particular.

According to Pearl and Reed,

> The extrapolated portions of the curve have no bearing whatsoever upon the question of the adequacy of the curves to describe the *known facts* of population growth. It is upon the success or failure of the attempt to demonstrate this adequacy, *and upon this alone*, that the judgment of the scientific validity of the hypothesis must rest.[1]

8. Cf. Knibbs, loc. cit.
9. "The population of Canada," Science (Jan. 23, 1925), lxi, 87–89.
1. Studies in Human Biology, pp. 586, 587. Italics theirs.

If the logistic formula is to be taken as a rational law, and not as an exercise in empirical curve-fitting, this is a somewhat surprising statement. For if the formula is a rational law, that is, if it somehow reflects the mechanism — a mechanism explainable or describable in terms of known principles — by which human population growth is what it is, it should also reflect what that growth will be. There should be every reason to suppose that the law will continue true of future growth and hence that the formula should have reliability for predictive purposes. Be this as it may, we cannot overlook the fact that Pearl himself is greatly interested in the application of his formula to the forecasting of population growth, and that the large amount of attention which his work has received is directed primarily to his predictions. He himself says:

> What we want obviously is a mathematical picture of the *whole* course of population in this country. It is not enough to be able to predict twenty or fifty years ahead. . . . It would be the height of presumption to predict *accurately* the population a thousand years hence. But any real law of population growth ought to give some general and approximate indication of the number of people who would be living at that time within the present area of the United States, provided no cataclysmic alteration of circumstances has in the meantime intervened.[2]

While Pearl thus reveals his interest in prediction, does he not also at the same time admit how little predictive value there is in his logistic formula, and indeed suggest the obstacles in the way of any mathematical method of forecasting population growth?

He states the "real" law of growth, as a basis for prediction, with a damaging proviso:

> The prediction of future populations by extrapolation is wholly dependent upon and always carries with itself the assumption that in the period forward from the latest observed population datum to the approximate attainment of the upper asymptotic population,

2. Pearl, op. cit., pp. 566, 567. Italics his.

no fundamentally *new factor of forces influencing the rate of population growth different from those which have operated during the known historical period of this population's growth shall come into play.* In short, the prediction is always based upon the assumption that the conditions which led to the law according to which that particular growth has occurred in the known past will continue to operate.[3]

Every scientific law, of course, is stated provisionally, since absolute certainty is impossible. Every causal law, or law of sequence, is stated in the form: So far as observation goes, event A is always followed by event B, provided conditions (that is, other causes or modifying factors) are the same. Pearl, therefore, has a perfect right to attach a proviso to his law, indeed, would be unscientific if he did not. But it must be observed that in the mechanistic laws of the more exact sciences, where experimentation and precise observation are possible, the proviso is more formal than otherwise. All science is based on probability, as all observation is subject to error. But as between the physical sciences and the biological and social sciences there is a vast difference in degree of probability, not only because of the practical impossibility, in the social sciences, of using the method of experimentation and because of the greater difficulty of observation, but because of the greater multiplicity and variety of the phenomena involved. A law of physics, or chemistry, or even of genetics, may be stated with the proviso, "conditions remaining the same," and the probability that the law will "work" in the next case to which it is applied may remain very close to certainty. But any law expressing human behavior, either individual, or in the statistical aggregate, has a much lower degree of probability, simply because the "other things" assumed to remain constant may include a number of important influences

3. Pearl, op. cit., p. 587, Italics his. See also The Biology of Death, p. 255.

which do not remain constant. Nor do they through an indefinite time necessarily counterbalance one another according to any statistical law of averages. To look for a rational "biological" law of population growth and to apply such a law to the prediction of population growth is simply to ignore or unduly to minimize this fact.

The proviso that Pearl repeatedly attaches to his law obviously robs it of any practical predictive value for other than very short periods, a decade or two at most. On occasion, Pearl is not entirely oblivious of this fact himself, as when he comments on Gregory King's erroneous prediction, in 1696, of England's future population growth. "Plainly," he says, Gregory King "had no conception of what industrial development was to do, any more than we have now any adequate notion of what may happen in the next century to upset the predictions of our curves." [4] Again he says,

> The figures really express what the probable future populations would be if the conditions of the nineteenth century were to remain permanently unaltered. For the next ten or twenty years . . . the predictions given by the curves are undoubtedly highly accurate in most cases. But longer-range predictions could be taken seriously only by someone who denies the fact of any and all evolution.[5]

This is surely a salutary warning, though somewhat belated.

That Pearl does not take his own provisos seriously enough is indicated by two things. So enthusiastic is his faith that his logistic equation reflects a rational biological law, that he generally is oblivious to the highly variable, yet extremely significant, psychological factors which may cause relatively abrupt change in the rate of population growth. And secondly, he pushes his curves forward and backward over centuries — for different countries variously back to 1700, 1600, and even 1500,

4. Studies in Human Biology, p. 602.
5. The Biology of Population Growth, p. 24.

and forward to 2000 and 2100.[6] For New York City, where presumably his predictive services were engaged for practical purposes, his curve extends to 2100.[7] And all this on the assumption that "the average standard of living, method of agricultural production, etc." do not change, or that changes in them will be negligibly small.[8] Surely, prediction based on such assumptions cannot but be for all practical purposes misleading and empty.

Since no one would attempt to predict, save for speculative amusement, and for a very brief period, social, economic, political, intellectual, and religious changes, all of which are almost certain to have more or less profound influence on birth, death, and migration, one would be tempted to the inference that Pearl is driven by the fine frenzy of pure intellectual play, did he not in his later writings [9] broadly hint that he feels himself to be on the trail of a great discovery — a "rational," "mathematico-biological" law of population growth, universally valid. In fact, even in 1924, his logistic curve seems to him "fairly to correspond, in a modest way, to Kepler's Law of the motion of planets in elliptic orbits." He modestly adds, however, that the logistic theory of population growth lacks "the heuristic element which Newton added in showing that gravitation would account for elliptic orbits." [1] This heuristic element Pearl now thinks he is near to laying hands on, in a (somewhat mystical) causal correlation between density and rate of growth.[2]

6. Studies in Human Biology, pp. 590–635.
7. Pearl and Reed, Predicted Growth of Population of New York and Environs, 1923.
8. Studies in Human Biology, p. 566, note. Cf. Knibbs, op. cit., pp. 389–391.
9. The Biology of Population Growth, 1925.
1. Studies in Human Biology, p. 585.
2. The Biology of Population Growth, 1925. See below, p. 590.

Pearl's idea of new factors which may upset prediction is apparently that they must be catastrophic in action, or of such magnitude as to cause epochal change in culture.

> The only ones we have found any evidence for the actual occurrence of, in our extensive study of population, are those implied in the passage of a group of people from one stage or epoch of culture to another, as from the agricultural to the industrial; or, in the case of small countries, essentially catastrophic occurrences such as changes in boundaries by war, extensive famine, or migration in a short time period of a large fraction of the total population.[3]

In accordance with this very inadequate conception, is his idea of cycles of population growth. When known population growth fails to flatten out as it should according to the formula, but takes on a new lease of life, Pearl simply adds a new curve, with its own constants, to the old.[4] Mathematical ingenuity can doubtless fit a complex empirical curve to population which recalcitrantly refuses to grow according to a simple S-curve. The trouble is that we cannot predict whether or when a new cultural epoch will produce a new cycle of growth.

We cannot, indeed, be sure that a new cultural influence is not now at work in the United States, one which may be of sufficient speed and magnitude to require drastic, but indeterminate, revision of Pearl's formula. Already Dublin and Lotka have shown that our present actual rate of natural increase, 10.99 per thousand, is equivalent to a rate of only 5.47 per thousand when the influence of immigration and decline of birth rate in the past, in producing an abnormally large proportion of women in the child-bearing ages, is eliminated.[5]

3. Studies in Human Biology, p. 587. Even so, he finds that "the most devastating calamities make but a momentary flicker in the steady progress of the curve" (The Biology of Death, p. 247).

4. Studies in Human Biology, pp. 605–610, 621–626 — the cases of Germany and Japan.

5. "On the true rate of natural increase," Journal of the American Statistical Association (Sept., 1925), xx, 305–339. Cf. L. R. Conner, "Fertility of marriage and population growth," Journal of the Royal Statistical Society (May, 1926), lxxxix, 553–566.

Dublin bases his opposition to the birth-control movement on the ground that our birth rate would soon become insufficient to maintain a stationary population if the practice of contraception should become general.[6] Without sharing in Dublin's sentiments, one may easily perceive that in the rapid spread of contraception, which, however old it may be sporadically among certain nature peoples,[7] or in sophisticated upper classes, must in its modern expansion be regarded as one of the most conspicuous expressions of the rapid democratization and the rational individualization of the western world today, there is enough cultural dynamite to throw any predictive mathematical formula of population growth far off the track. While we may believe it highly probable, broadly speaking, that birth control will still further retard population growth, anything like exact mathematical prediction is out of the question.

Population increase is determined (proximately, not ultimately) by the relative numbers of births, deaths, and migrants. If we knew the course which the birth rate and death rate will take, with the resultant changes in age distribution, and the reflex influence of these upon birth rates and death rates still further in the future, we could, as Dublin and Lotka have shown, make mathematical prediction. But we do not know the future of cultural changes. We cannot know just how far advance in medical practice is likely to reduce the death rate. We do not know certainly that our immigration policy will not be reversed. Nor can we be sure that, under a possible rampant militaristic nationalism, a revulsion of sentiment with regard to birth control may not occur.

6. "The excesses of birth control," an address delivered before the Sixth International Neo-Malthusian and Birth-Control Conference, New York City, 1925; "The fallacious propaganda for birth control," Atlantic Monthly, Feb., 1926, pp. 186–194.

7. A. M. Carr-Saunders, The Population Problem, 1922, pp. 177 186, 256, 266, 287, 315.

Who, for instance, would dare predict the cultural outcome of Italian Fascismo's mystical nationalism, — aiming, as a prominent Fascist recently put it to the writer, at "the happiness of the collectivity"! — or the effect on the Italian birth rate of Mussolini's recently promulgated population policy? Four centuries ago some one dug up a few unpalatable tubers of *solanum tuberosum* in South America and sent them to Europe. Who then could have seen that the potato would be the cause of one of the most rapid population increases and one of the worst famines on record, of a dramatic migration, and of a political problem which it took a century to settle? Common sense seems to indicate that, where there are so many unknown and unpredictable variables, mathematical prediction of population growth is at best only an indoor sport.

If, however, it should be established that the trend of population growth can be accurately described by some type of mathematical equation, the fundamental question remains. Is the formula purely empirical, or is it supported by a sufficient amount of *a priori* knowledge to give it status as a rational law? Or if the requisite *a priori* knowledge is not immediately available, does the formula so unfailingly fit every case of population growth to which it is applied as to establish a high degree of probability that there is a discoverable natural mechanism by which population in general grows in this particular way? Adequate consideration of this problem would require examination of the logic of statistics, — an inadequately developed field of thought, — and would involve a consideration of the relation between the statistical and the mechanistic views of nature.[8]

8. Cf. J. T. Merz, History of European Thought in the Nineteenth Century, 1903, ii, chaps. 6 and 12. F. C. Mills, "On measurement in

A rational generalization or law is one which subsumes observed phenomena in terms of previously discovered scientific laws, or at least in terms which are in harmony with such known laws. Established and systematized scientific knowledge, while it has been derived ultimately from empirical induction (with such aid as may be from deductive logic and mathematics), is for purposes of scientific research *a priori* knowledge. It must not, of course, be confused with *a priori* metaphysical concepts and "principles," which are unverifiable, and with which science has nothing to do.[9] It is not to be inferred that *a priori* scientific knowledge is perfect and final. It is always in process of modification by further research, which puts it to the acid test of conformity with observed fact. It is indeed possible that some "established" scientific law which has hitherto "worked" may have to be drastically reformed or even abandoned, because of new empirically known facts which the old law does not cover. Ordinarily, however, established knowledge (as differentiated from hypotheses) is not overturned by empirical investigation. An empirical generalization simply describes, statistically or otherwise, the observed behavior of a given type of phenomenon, — for example, population growth, — without attempt to correlate this behavior with known laws or to state the causes of the behavior. Granting for the sake of the argument that Pearl's logistic equation is a true description of population growth, it is as it stands only an empirical generalization. It

economics," in The Trend of Economics, edited by R. G. Tugwell, 1924, chap. 2. A. A. Young, "The trend of economics" (a review), Quarterly Journal of Economics (Feb., 1925), xxxix, 164–167. Josiah Royce, "The mechanical, the historical, and the statistical," Science (April 17, 1914), N. S. xxxix, 551–556. Pearl, Modes of Research in Genetics, 1915, chap. 3.

9. Cf. Pareto, Manuel d'économie politique, 1909, pp. 27, 28; Traité de sociologie générale, 1917, ii, chap. 1.

relates population growth causally to no known laws, physical, biological, or social; it says nothing as to the causes of the varying rates of growth.

Now, despite the vagaries of those who reject the mechanistic view of nature, on the ground that nature is not strictly "uniform" but has her unaccountable and unpredictable variations, and hence that natural phenomena can be generalized on only in terms of statistical averages and deviations, it is fairly obvious that science is possible only on the assumption that nature is completely and dependably mechanistic (or systematic) and that appearances to the contrary are due to our limited technique of observation.[1] Causation scientifically means only invariable, systematic (or "mechanistic") sequence. A causal law states the steps in this mechanistic sequence or relation, and if complete does not omit any of them. A rational law is essentially a "causal" law in that it does not leave the phenomena with which it deals hanging in the air (as a purely empirical generalization does), but relates them to the known laws of the mechanism of nature. A rational generalization carries more weight than an empirical one, because it has the support of previously

1. Space permitting, distinction would be made between "mechanistic" and "mechanical." Modern intra-atomic physics has given up the "mechanical" concept, but not the "mechanistic." This means simply that a given configuration of electronic particles or electrical charges with given directions and velocities will be followed by a certain other configuration in a unit time — which is merely saying that the first configuration is the "cause" of the second. Speculative and quasi-metaphysical chemists like Gilbert N. Lewis (The Anatomy of Science, 1926) may reject "causation," but the laboratory physicist retains it, in this sense, even tho he may be driven into the fourth dimension. He may resort to statistical correlations, but he does not for that reason infer that there are no exactly determinable sequences. The error of Royce and, following him, Mills, is that they misinterpret Clerk Maxwell, take no account of the advance of physicists' powers of observation since his time, and confuse a method of inference with the method of nature. Pearl, it may be noted, does not fall into this error. (See his Modes of Research in Genetics, chap. 3.)

established knowledge. Naturally no scientist will be content with an empirical law if he can transform it into a rational law. Pearl is on perfectly legitimate ground, therefore, in his desire to find a rational, *a priori* basis for his formula.

It is natural that attempts to fit an empirical generalization into the existing body of *a priori* knowledge and thus transform it into a rational law should begin by analogy, and it is desirable at this point to examine Pearl's use of analogy. Quetelet started a search for a law of changes in the rate of population increase on the analogy of the motion of a body through a resisting medium.[2] He surmised that, while population tends to grow in geometrical ratio, the resistance to growth increases as the square of the speed with which population tends to grow. He did not follow the matter up, however, probably because of lack of adequate statistical data, perhaps also because Verhulst found that the contemplated analogy was mathematically permissible only on the assumption that the resisting medium itself has an increasing density.[3] Something akin to this resisting medium analogy is implicit in Pearl and Reed's first postulate — that of finite area — taken in connection with Pearl's later thought with reference to the influence of density of population.[4]

Pearl is greatly impressed by the fact that other be-

2. Physique sociale, Vol. i, pp. 275–279. Système sociale, 1848, pp. 174, 175.

3. Verhulst was a professor of mathematics in the École Militaire, Brussels, in Quetelet's time. He anticipated Pearl and Reed's logistic formula by seventy-five years, but his published papers bearing on the subject were not uncovered in Europe till 1918, and were unknown in this country till cited by Pearl and Reed. (See Pearl, Studies in Human Biology, p. 569, and Yule, "The growth of population and the factors which control it," Journal of the Royal Statistical Society, (Jan., 1925), lxxxviii, 4, 5, 57.) Pearl and Reed's work on the formula was entirely independent from that of Verhulst.

4. See below, p. 591.

ings than humans increase in numbers in accordance with logistic curves. He thus has from biology an analogy which seems to him a promising clue to the rationalizing of the logistic formula. We may best let him state his position in his own terms. Speaking of the causes which lie behind the shape of the growth curve, he says:

> The one real step in the direction of the discovery of these causes which has so far been made is the demonstration that these causes are not things peculiar to human beings, such as the economic or social structure or organization of human society. This is proved by the experimental demonstration that the same curve describes with precision the growth of population of the fruit fly *Drosophila melanogaster*. This means that the search must be thrown back to more fundamental natural causes, biological, physical, or chemical. It seems probable that the direction of further research in this field is not along the statistical pathway with human population as material, but along the experimental, where populations of lower organisms can be studied under controlled conditions.[5]

The inference here is plain. If, starting from a single pair confined, with suitable food, in a half-pint milk bottle, the fruit-fly population in the bottle grows in accordance with the logistic formula, the human population confined to a definite area of land must do so also.

Pearl pushes analogy still further. Various laboratory studies have been made of the rate of growth of *individual* organisms, and it has been found that the curve of growth is a logarithmic function.[6] Thus in his latest work on population Pearl presents the individual growth curves for white rats, pumpkins, and tadpoles' tails. From these he proceeds by easy and plausible stages to the growth of colonies of yeast cells, and of drosophila and human aggregates.[7]

5. Studies in Human Biology, p. 585. See also p. 562.

6. Cf. T. B. Robertson, "On the normal rate of growth of an individual and its biological significance," Archiv für Entwicklungsmechanik der Organismen (1908), xxv, 581–614; Spillman and Lang, The Law of Diminishing Returns, 1924, pp. 11–14, 18–23, 25–30, 44–52.

7. The Biology of Population Growth, 1925, pp. 5–44.

For the analogy beween a drosophila population and a human population, some remote rational basis may possibly be found. It would have to rest on the fact, or hypothesis, that nutrition and the reproductive urge, in every animal species from amoeba to man, are chemical in nature, and everywhere subject to the same chemical laws. Behavioristic psychology would admit this. But that such an analogy is thereby lent any real scientific value as a guide to a rational law of human population growth does not follow. The nutrition and reproduction of fruit flies are doubtless simply and directly chemical in nature. Human behavior, however, while it is doubtless electrochemical in ultimate mechanistic analysis, is not so direct and simple. Human actions and attitudes are no doubt conditioned by the physical state of the individual, but they are also resultants of very complex stimuli from the environment, physical, economic, political, and socio-psychological. The problem of population growth is therefore more directly and significantly a problem of social psychology than one of bio-chemistry. Such considerations are all too frequently overlooked by biologists, Pearl included. The higher the organism, the greater the complexity of its structure and functions and the more variable its stimulus-response relation to its environment. The higher the organism, also, the more complex is the environment to which it responds. In the case of human beings, at least those above the lowest cultural level, there are many practically unmeasurable and unpredictable variables which influence vital phenomena — marriage, birth, death, and migration — and thence the rate of growth of population.

Pearl's reasoning is that because the growth of an individual organism and that of an aggregate may both be expressed by the same logarithmic formula, therefore

the same causes must lie back of both phenomena.[8] Logarithmic curves of one type or another, however, have been found to depict a great variety of natural and vital phenomena besides those already mentioned; for example, the growth of children,[9] the increments of agricultural yield under varying applications of fertilizer, water, and light respectively,[1] autocatalytic reactions, the rate of the cutting of teeth in children of different ages, the Weber–Fechner law of the relation between strength of stimulus and intensity of sensation, the rate at which skill is acquired in manual processes, the mathematical version of the theory of diminishing utility, and even the reaction of a people or a class to social and political pressure.[2] If, then, the same type of empirical mathematical formula indicates the same causes, we should not hesitate to push analogy, loose tho it be, back to include, in the same category with population growth, phenomena as diverse as those noted. One fallacy in any such analogy lies in the fact that any phenomenal change that takes place at a decreasing rate in time, can be represented by a logarithmic curve. Even for the analogy between growth of an individual organism and growth of an aggregate, it is, to the present writer, impossible to see any rational warrant in a study of the population problem.[3]

8. Cf. Studies in Human Biology, p. 562: "While the increase in size of a population cannot on *a priori* grounds be regarded, except by rather loose analogy, as the same thing as the growth of an organism in size, nevertheless it is essentially a growth phenomenon."

9. B. T. Baldwin, Studies in Child Welfare; University of Iowa Studies, vol. i, no. 1, June 1, 1921.

1. Spillman and Lang, op. cit., and experiment station records there cited.

2. F. A. Lange, Die Arbeiterfrage, 1870, pp. 114 ff. For a sketch of various economic and social applications which have been found or alleged, see E. Lang, "The law of the soil," in Spillman and Lang, op. cit., pp. 164–173.

3. Hotelling finds that the movement of population approximates formulae for the diffusion of heat (Mathematical Theory of Migration,

We come now to the problem of decreasing rates of increase, and the damping off of population growth after the point of inflection of the growth curve has been reached.[4] What rational explanation can be found for this phenomenon? It is clear that there must be some finite upper limit to numbers. This limit is fixed (within the varying powers of changing productive technique) by the natural resources available. It is conceivable that population might increase at an unvarying geometrical rate until it hit this limit abruptly. Both common sense, and the later censuses of certain countries, as Pareto pointed out in 1896, indicate that the rate of growth will gradually slacken. So also, in all probability, will absolute increases. So far as *a priori* knowledge goes, this slackening may or may not be in accord with the logistic curve, but in any case it needs rational explanation.

In his latest work, *The Biology of Population Growth*, Pearl turns to this problem. He selects the native

University of Washington, 1921; cited by H. B. Woolston, "The dynamics of population," Journal of Social Forces, Jan., 1924). Are we then to conclude that human migrations and the diffusion of heat are fundamentally of the same natural order? Curiously enough, we find that, in a paper written in 1923, Pearl himself held that the rationality of the logistic curve could not be established by such analogy: "Inasmuch . . . as this same type of curve also describes equally well other sets of phenomena which can possibly have only the most remote, if any, relation to any biological phenomenon, it seems to me evident that the mere fact that a particular sort of equation describes population growth can give but little if any insight into the operation of the biological factors which underlie this growth." "Trends of vital indices," Studies in Human Biology, chap. 9.

4. It should be clearly understood, in passing, that rates of increase and absolute increases are not the same thing. A decreasing rate of increase is not at all incompatible with successively larger absolute increases, as the figures for the United States show. Pearl deals throughout, not with percentage rates of increase but with absolute increases. The "damping off" takes place through a series of decreases in the absolute increases. By the logistic formula successive absolute increases (after the point of inflection) approach the limit zero.

Algerian population for particular attention, because it is, since the effective subdual and development of the country by the French, about 1880, the only population which he can find that has gone through practically a complete cycle of growth. He finds that the growth curve is logistic throughout.

It is possible that at least a part of the explanation of the flattening out of the growth curve of human populations may be found in changing age constitution, incident to falling birth rates and death rates, and *vice versa*. The outstanding and significant fact is that both the birth rate and the death rate of the native Algerian population are declining at a speed comparable to the decline of these rates both in the European populations resident in Algeria and in certain specified European countries. Pearl apparently has some idea of a possible connection between this fact and the shape of the growth curve, but his discussion is lacking in clearness and is in the end inconclusive.

After studying the available literature on Algerian culture, Pearl is confident that the decline in the death rate is not at all caused by French public-health measures, which he thinks have hardly affected the native population, and that the decline of the birth rate cannot be attributed to birth control, which the authorities whom he quotes hold is not practised by the native population. After ruling out possible causes of the declining death rate, such as a decline in syphilis, he leaves the fall with practically no explanation.

Presumably, we should look for at least a part of the explanation of the falling death rate in the changing age distribution of the population. Such a change would be produced by the relatively rapid growth of population between 1881 and 1901. But Pearl gives no analysis of age distribution. Instead, he contents

himself with a long quotation from Yule.[5] A number of statisticians have recently turned their attention to the problem of the reciprocal relations between changing birth rates, death rates, and age constitution.[6] A great deal yet remains to be done before we have an adequate mathematical theory of the possible relations. Yule's discussion of the trend of birth rates and death rates has to do with a limiting case — a hypothetical population "suddenly jerked into a fresh cycle of growth," in which deaths at ages are supposed to remain constant. Pearl relies upon this hypothetical case to give a clue to the declining Algerian death rate — altho in Yule's case the death rate gradually rises.

The initial effect of such a "jerk" would be to raise the birth rate and consequently the death rate. Thereafter, for a brief period, the death rate would fall, then gradually rise throughout the remainder (about three fourths) of the cycle — always on the assumption that death rates at ages remain constant. Certainly it is difficult to see how Yule's hypothetical case helps Pearl. For Pearl's Algerian cycle is very short, not over seventy-five years, while Yule requires 150 to 175 years for the "initial oscilatory movement" in the death rate to be ironed out. Moreover, the Algerian population is avowedly in the late stage of the logistic growth cycle, in which the death rate should be rising, not falling. We need, obviously, detailed historical statistics of the Algerian death rates at ages.

5. Cf. Yule, "The growth of population and the factors which control it," Journal of the Royal Statistical Society (Jan., 1925), lxxxviii, pp. 1–56.

6. Yule, loc. cit.; A. L. Bowley, "Births and population in Great Britain," Economic Journal, June, 1924, pp. 188–192; L. J. Dublin and A. J. Lotka, "On the true rate of natural increase," Journal of the American Statistical Association (Sept., 1925), xx, 305–339; L. R. Connor, "Fertility of marriage and population growth," Journal of the Royal Statistical Society (May, 1926), lxxxix, 553–566.

Nor is Pearl any more specific as to the statistical causes of the declining birth rate. The fact that the native birth rate is declining, but at a rate slower than that of certain specified European countries, he says, "is precisely what would be expected from the theory of the logistic curve, considering the position of each of the populations on their own logistic and their death rates."[7] This leaves something to the reader's intuition, but the implication probably is that, after the growth curve passes its point of inflection, the proportion of women in the child-bearing ages falls off, with the consequent further decline in the birth rate. Yule, however, concludes that the percentage of women in age-groups 20–50 changes very little in a longistic population.[8] Dublin and Lotka show that in the United States the percentage of native women in age-groups 15–35 for the actual population of 1920 is much larger than the percentage in the same age-groups would be in a population of fixed age distribution.[9] The excess of "native" white women in age-groups 15–35 in the actual population may be due in part to heavy immigration between 1885 and 1905. Be that as it may, the seeming lack of agreement between statistical authorities needs elucidation. In any case, Pearl gives no proof that change in the proportion of women in the child-bearing ages exists in the Algerian population, or that, if it does exist, it is sufficient to account for the declining birth rate. In fact, inasmuch as he proceeds to advance his theory that fertility is negatively correlated with density of population, it is not clear that he thinks the relation between changing age constitution, birth rates, and death rates contains the explanation of the logistic curve.

7. The Biology of Population Growth, p. 119.
8. Yule, loc. cit., p. 40.
9. Dublin and Lotka, loc. cit., pp. 315, 320.

The interactions between changes in age constitution, crude birth rates, and crude death rates is exceedingly complex. If any general theory of these relations can be worked out, it will be the work of highly expert mathematicians. But the problem can be avoided, where registration and census data are adequate, by employing refined rates. Had Pearl presented fertility rates per 1000 women of childbearing age, we should know much more about the Algerian population movement than he has told us, and we should not be so much in doubt as to why he appeals to Yule's hypothetical calculations. Certainly he does not follow out Yule's lead.

Failing to establish any determinate mathematical relation of birth rates, death rates, and age constitution to the shape of the growth curve, Pearl resorts once more to analogy, taking us back to jars of fruit flies and experimental poultry pens, in both of which he has found fertility to be negatively correlated with density of population.[1] Here then is additional analogy, which possibly offers "a clue to a part at least of the solution of the problem of the nearly world-wide decline in the birth rate." We may well share in Pearl's belief, late as he is in expressing it, that "one must be cautious, however, in applying unreservedly biological results obtained under relatively simple conditions, to human populations living in an extremely complicated environment."[2] Even for his hens, Pearl is forced to observe that "the experiments seem rather clearly to indicate that . . . there is another element apparently involved in the case besides mere physical density of population, which element in our ignorance we may perhaps tentatively call psychological."[3]

1. Biology of Population Growth, pp. 133–145.
2. Ibid., p. 139.
3. Ibid., p. 145.

Since experiment on human populations is not possible, Pearl turns once more to statistics, and carries out certain partial correlation calculations to see if any apparent relation between birth rate and density will emerge. In his assumption of a possible connection between density and vital phenomena Pearl is not entirely without precedent. In 1843 William Farr concluded that mortality varies as the sixth root of the density of population.[4] "Farr's law" has recently been taken up again by Brownlee, who thinks that it is confirmed for certain parts of the English population.[5] One of Pearl's students, T. J. LeBlanc, has shown, however, that Farr's law does not hold in the United States;[6] and Newsholme concludes, from the fact that for twenty years the urban death rate in England has fallen more rapidly than the rural, that the "law" is in the process of disappearing.[7]

Pearl thinks that the failure of Farr's law to obtain confirmation from American statistics may be due to the difficulty of determining what is a proper measure of *biological* density,[8] whatever that may mean. Since Pearl persistently refuses to deal with psychological

4. "Causes of high mortality in town districts," Fifth Annual Report of Births, Deaths, and Marriages in England (2d ed.), 1843, pp. 406–435. In 1875 Farr modified his formula by substituting approximately the eighth root for the sixth ("Effects of density of population on health," Supplement to the 35th Annual Report of the Registrar General (2d ed), 1875, pp. xxiii–xxv). Cf. Farr, Vital Statistics, Memorial Volume, 1885, pp. 172–176; Newsholme, The Elements of Vital Statistics, new edition, 1923, pp. 280 ff.

5. "Studies in the meaning and relationship of birth and death rates — density of population and death rate (Farr's law)," Journal of Hygiene (July, 1915), xv, 11–16. "Notes on the biology of a life table," Journal of the Royal Statistical Society (Jan., 1919), lxxxii, 281–283. "The use of death-rates as a measure of hygienic conditions," Medical Research Council, Special Report No. 60, 1922.

6. "Density of population and mortality in the United States," American Journal of Hygiene (Sept., 1924), iv, 501–558.

7. The Elements of Vital Statistics, 1923, p. 284.

8. Biology of Population Growth, pp. 132, 146.

factors, a "biologically significant measure of density" must measure conditions which bear directly, or physiologically, on birth rate and death rate — presumably the effect of density on food supply and health conditions. Partly by reason of limitations of statistical data, partly perhaps because he recognizes the danger of inferring "biological" differences from the difference between urban and rural birth and death rates, he confines his attention to urban populations. He admits that persons per acre is an unsatisfactory criterion of density, but uses it in preference to persons per room, which most social workers and statisticians would assuredly say is the better measure.[9] Taking as basis the census data for cities of over 25,000 in the Birth Registration Area in 1920, he gives a long series of results of partial correlation, and comes to the conclusion that when total population, wealth per capita, school attendance (of children aged 18–20), and persons per dwelling are held constant, the correlation between birth rate and persons per acre is $-.175 \pm .057$. In view of the admitted unsatisfactory nature of the data, it is remarkable that a statistician of Pearl's ability can take this result as significant. So small a coefficient is entirely unequal to the burden put upon it. But to Pearl it indicates that for the human population — at least the urban — "the direct and indirect biological effects of density of population upon reproduction" constitute "one *vera causa* for the damping off of the growth of population as the upper limit of the logistic curve is approached."

Here then, at last, we reach the railhead of Pearl's research. We have traversed much mathematical country and have proceeded throughout by analogy. Starting from an empirical station, we have attempted

9. Cf. Newsholme, The Elements of Vital Statistics, 1923, p. 285.

to build a line to some rational point — and have arrived at $-.175 \pm .075$. We set out to prove that the logistic equation is a rational law. We have reached the border of mysticism. To the present writer it seems more than doubtful whether any extension of Pearl's line can take us away from this arid region and bring us to a rational law of population growth — even if there is theoretically a possible formula for one.

Pearl has not demonstrated a correlation between density and human population growth. Even if he had, it would give us no rational law, or description, of mechanistic sequences resulting in retarded growth. To make a direct correlation between fertility and density is to abbreviate too much. It is to ignore highly important middle terms — the standard of living, social conventions, the state of the arts, industrialization, the growth of individualism, rationalism, and democracy, and the spread of contraceptive knowledge.

The logistic formula may be taken for what it is worth as an empirical expression, and no more. Simple common sense tells us that population growth must either slow down or come abruptly to a stop. It tells us also, that as people learn the art of contraception the fertility will fall, be density what it may. But not a jot of real evidence has been given that the causes bearing on population growth are of such nature and composition that growth must, or will, follow the logistic curve.

The biologists themselves, by their persistent refusal or inability to recognize the profound bearing of the psychology of the learning process and the significance of differential opportunity, have done much to retard the progress of eugenics as a science, and to turn many against it as an art. If now they are to turn their attention to the problem of the quantity of population and propose "scientific" solutions on lines of analogy,

and mathematical statistics which take no account of the significant factors peculiar to human culture, we may perhaps well wish that the slight debt which biology owes to economics, through Darwin's chance reading of Malthus, may be allowed to run. Population theory is not likely to be benefited by such repayment.

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THE AMERICAN RICE-GROWING INDUSTRY: A STUDY OF COMPARATIVE ADVANTAGE

SUMMARY

The significance of the industry in economic history and in the study of international trade, 595. — I. Changes in domestic production: South Atlantic states, 598. — Mississippi delta, 603. — Southwestern states, 605. — California, 611. — Reduction in labor cost, 613. — Expansion of total output, 615. — Increasing yield per acre, 617.

II. Competitive position of the American industry: Changes in imports and exports, 620. — Conditions favoring domestic culture, 623. — Advantages of oriental production, 628. — Relation of wages and other incomes to the comparative position of the respective industries, 636. — Conclusion, 641.

THE cultivation of rice in the United States has in the last few decades undergone a revolution which is of significance both to the economic historian and to the student of comparative advantage in American industries. For the former, interest lies in the fact that the United States in the last decade has again become an exporter of rice, as it was in the colonial days and, indeed, in the years preceding the Civil War. Tho the future of rice exportation is in some doubt, the reattainment by the United States, at least temporarily, of an exporting position has a strongly romantic flavor. Two hundred years after the increasing surplus of colonial production occasioned a reconsideration by the British of their restrictive policy toward rice exportations, — relaxation coming, it will be recalled, in 1730, — exports were again increased in a striking manner. Shipments in this latter period, to be sure, were not predominantly to southern Europe, — "south of Cape Finisterre," —

but to northern Europe, to South America, and even to the Orient. More important still, the recent history of rice growing in the United States is of significance to the economic historian as a study of changing technique in agriculture. As one writer has put it, "the production of rice has probably undergone greater changes than that of any other crop grown in the United States," [1] and a survey of the transformation seems to justify this conclusion. The cultivation of rice, for centuries primarily of a manual character, has been converted into one which employs large and complicated machinery on as broad a scale as any agricultural production of the country. If in addition to such considerations attention be given to the rapid expansion of domestic production, to changing localization of the industry, and to the introduction of new varieties of plant, the course of development in this branch of agriculture holds much that is of moment to the historical student.

For the student of international trade and of comparative advantages among American industries, an examination of rice growing in the United States is of particular interest, since the obstacles in the way of successful competition with other producing areas seem at first sight quite overwhelming. For example, American production, even at its maximum, has never amounted to more than a negligible proportion of the total world crop — something like one per cent. Indeed, the export trade of the three chief rice-exporting areas, British India, French Indo-China, and Siam, has frequently reached a volume five- or six-fold the whole of our domestic output. Competition of foreign supplies would seem likely, then, to be exceptionally severe under normal conditions. In fact, it is doubtful if any

1. Census of Manufactures, 1914, ii, 424.

agricultural enterprise in the United States has been faced with a comparable situation.

But equally important with respect to the relative strength of the domestic industry is the fact that American rice growers must meet the competition of an oriental product. The long hours of work, the arduous character of the labor endured, and the meagre returns to the oriental rice farmers are well known. Such extreme conditions, indeed, have come to be identified with eastern agriculture in general. Obviously here is the possibility of severe competition; and it is no wonder that domestic rice planters complain: "Of all American agriculturalists, only he who raises rice has to match his skill against the very dregs and lowest type of pauper labor to be found throughout the Orient. Our other cereal crops are produced in competition with white men in Canada, Argentine, and elsewhere." [2] Or, with more spirit than accuracy: "The American farmer must compete with barbarism; he must overcome 'with his special technique' the hordes of Oriental farmers." [3] And surely much attention must be paid to this circumstance. How can American producers, paying the normally high wages of domestic farm laborers and themselves requiring a high standard of return, hope to contest even the home market with the Oriental? And then, how could it be possible that American producers should meet the prices set by the large eastern rice-exporting countries, as they did in 1921, when 90 per cent of the California rice crop was exported to Japan, "the land of bounteous rice crops"?

But these major items do not exhaust the list of features unfavorable to the American industry. The domestic demand for the article has always been small,

2. Tariff Hearings, House of Representatives, 1921, p. 1723. Similar jeremiads are to be found in the tariff hearings of other years.

3. Rice Journal, March, 1908, p. 46.

even in comparison with that of western countries, not to mention the heavy consumption in the Orient; the American demand has been inelastic, making overproduction particularly costly; popular prejudices have generally favored one type of rice, the long-grain sort, and thus have handicapped the introduction of other varieties more suited to particular producing areas; and, finally, prohibition has come to deal the industry a blow, reducing substantially the demand for broken rice, meal, and polish, the by-products or wastes of the rice-milling processes. These circumstances would seem to hamper domestic production either by putting obstacles in the way of large-scale operation and the introduction of varieties best suited to varying natural conditions, or by removing a possible compensation for a necessarily large production of imperfect goods. [4]

All in all, there would seem to have been few hopeful factors in the situation. Possibly cases of competition on their face less favorable to American industries may be found, but, when one considers the general ineptitude of agricultural undertakings to marked technical advance, they must be rare. Yet the domestic rice culture has in fact achieved the seeming impossibility of shipping its output not merely to European but also to eastern markets.

I

On the early history of rice growing in this country there is little need for comment. First introduced into South Carolina in 1694 (as a chance consequence, according to tradition, of a distress visit in Charleston of

4. Since the output of perfect, whole-grained rice may run as low as 40, or even 20, per cent of the original weight, with 65 per cent a good average even for the better types of rice, it is apparent that the value of the by-products and wastes is an item of peculiar importance in this industry.

a ship returning from Madagascar), the culture took root in particular areas sufficiently well adapted to the mode of cultivation then employed, maintained a healthy existence for many decades, and indeed spread to areas similarly situated in Georgia and North Carolina. Cultivation was always confined to level fields, — as those within an ox-bow of a stream, — located at points above the run of salt water but not beyond the influence of the tides in the several rivers of these colonies or states. By means of gates constructed to permit both the inflow at high tide and the outflow at low tide, the fields could be flooded and drained as desired. The combination of level ground and surrounding dikes permitted the retention on the fields of the height of water required during the several periods of the crop's development — sprouting, growing, etc. — when it is necessary to maintain two to six inches of water over the whole expanse of cultivated area. Rapid drainage at the end of the growing season allowed harvesting to be carried through before the grain began to shatter. Thus all the requisites of lowland rice culture were supplied; while, in addition, the rivers provided a convenient means of transportation to the "pounding" mills where the outer husk or "paddy" was removed.

Cultivation at this time and throughout the period before the Civil War was characteristically of the plantation type — of fairly large scale and utilizing slave labor. In a description which just anticipates the outbreak of the war, the units of operation are said to have been "of great extent, sometimes covering from one to two thousand acres, and employing seven hundred or eight hundred hands." [5] The work was chiefly manual,

5. Harper's Magazine, 1859, pp. 721 ff. See also Ruffin, Agricultural Survey of South Carolina 1843, pp. 105–110; and U. S. Patent Office Reports on Agriculture, 1849, pp. 305–307; 1850, pp. 323–325; and 1854, pp. 153–159.

comprising a number of hoeings and the final harvesting with hand sickles. Mechanical aids seem to have been used in the threshing and milling stages. The writer just mentioned speaks in 1859 of threshing being done by machinery on all the larger plantations — by "curiously-fashioned elevators and fanners" which "successively take up the sheaves, beat out the grain," etc.; while in the "pounding mills" just noted, "great steam- or water-worked mortars and pestles" were utilized to "pound off the slightly brownish coating or husk from the pearly grain," and an "equally interesting apparatus" rubbed off the inner cuticle and imparted a polish to the grains.[6]

Already by 1860 the industry in the Carolinas and Georgia, altho it had established a reputation for the highest quality of rice in the world,[7] had reached the limits of possible expansion, set chiefly by the necessary physical conditions for successful cultivation.

6. Harper's Magazine, 1859, p. 730. The structure of the rice kernel, and the processes required for the preparation of rice for market may here be briefly described. The grain as it comes from the threshing operation, commonly denominated "rough rice," has two coverings, the husk and the inner cuticle. The former is nowadays removed by treatment in an apparatus which consists of large revolving stones, the whole device being spoken of as "milling stones." The product, called "brown rice," is passed through machines called "hullers," two sets being usually employed, by which the greater part of the inner cuticle is removed. This type of machine may be described as "a grooved, tapering cylinder revolving within a concentric hollow cylinder so spaced as to rub loose a portion of the bran coat with as little breaking of the grain as possible." Thereafter the remaining layers of the cuticle are removed in an apparatus called a "brush," which consists of a vertical cylindrical frame, covered with loosely attached leather strips, which revolves at high speed within a cylinder of wire screening. The rice is fed in at the top, is rubbed vigorously between the flapping leather and the screen, and ultimately flows out at the bottom. Finally, a polish or lustre is imparted to the fully hulled grain in a sort of revolving barrel, in which the rice, with a certain mixture of glucose and talc, is tumbled about for a brief period of time. The product, denominated "coated" or "polished" rice, is now ready for the market in the form demanded by domestic consumers.

7. Copeland, Rice (1924), p. 207.

With the rising value of slaves, moreover, the costs of production must have risen appreciably, especially as the rice fields were situated in low, damp sections of the country, supposedly unbearable for white men and oftentimes fatal to blacks. Only the persistent fertility of the soil, sustained by the continued deposit of river silt, seems to have given any considerable support to the local rice culture. But this fertility was a powerful factor. As late as 1859, yields of forty to sixty bushels per acre were common, while some were reported as great as a hundred bushels.[8]

The rice-growing industry, then, continued to play a significant rôle in southern agriculture until 1860; but that date proved a high-water mark. The Civil War years form a turning-point in the history of this culture. The disturbances and suspended cultivation of the actual war period, to which was added the supervention of new labor conditions in the post-war era, caused a decline in operations from which the area never really recovered.

The industry in the Carolinas in part lost its earlier characteristic of substantially large-scale operations under the plantation system. Plantations were divided into smaller units, and the individual farmer cultivated fewer acres than formerly.[9] Farms of 150 to 250 acres may be considered representative of the period around 1900, and subsequently there was a further decline. The Census figures of acreage per farm are said by Mr. Chambliss, agronomist of the U. S. Department of Agriculture and specialist on the rice culture, to be highly misleading, at least for the South Atlantic area. Thus, the Census of 1899 reports the average

8. Harper's Magazine, 1859, p. 730. Contrast the average yield for the United States in 1919 as given below — 38.8 bushels.

9. Robarts, "Rice and its Culture," Popular Science Monthly, 1890, p. 829.

acreage per rice farm as 3.2 acres, altho Mr. Chambliss, who was resident in South Carolina at that time, gives the estimate presented in the text. The Census data presumably cover every farm on which any rice was grown, tho only a small patch was cultivated for the farmer's consumption alone. Total output in this region also decreased sharply, and never recovered fully. Between 1859 and 1869, output in South Carolina and Georgia is reported to have fallen from 187,000,000 pounds to 74,000,000, and thereafter the highest point reached in any Census year, that of 1899, was 95,000,000 pounds.[1] And this decline, we may note, took place despite the fact that now for the first time protection was extended to the industry through appreciable tariff duties.[2]

The decline of production in these southeastern states was not occasioned by increased importations from abroad. The country, to be sure, did change from an exporting to an importing basis, but total domestic

1. The course of decline in this area is instructive. Taking South Carolina and Georgia together, — North Carolina never having been an important producing region, — the production by decimal periods was as follows in millions of pounds of rough rice:

1839.... 81	1869.... 74	1899....95
1849....215	1879....110	1909....31
1859....187	1889.... 45	1919.... 8

In fact, there had been a radical slump in production in the years between 1859 and 1869, falling from an estimated average of 123,000,000 pounds in 1856–60 to one of 4,000,000 pounds in the succeeding five years. U. S. Department of Agriculture, Yearbook, 1909, p. 529.

2. Rice is first mentioned in our tariffs in 1846, when a duty of 20 per cent *ad valorem* was imposed. Since 1861, however, the tariff rates have been specific in character, rising from one cent a pound on cleaned rice in that year to 2½ cents a pound in 1864. This duty was slightly reduced in 1883, i.e., to 2¼ cents a pound, and again to 2 cents a pound in 1890. Thereafter the tax has remained at this figure of 2 cents a pound except under the tariffs of 1894 and 1913, when the duties were, respectively, 1½ cents and one cent a pound. For much of the period since the Civil War, these duties have meant, in *ad valorem* terms, a 33⅓ or 50 per cent rate.

production had grown rapidly in these post-Civil-War decades. The cause lay rather in increased domestic competition. Progress of technique in other areas, together with the fruitfulness of virgin soils elsewhere, had made rice-growing unprofitable on the old lands of South Carolina and Georgia. Methods of cultivation here had not changed since colonial days, and, on account of the character of the terrain, — the low-lying, somewhat marshy land, — they could not be changed to suit the requirements of the new system of production which was being adopted in other regions.[3]

Meanwhile, however, the cultivation of rice had begun its westward march. In contrast to the situation in the Carolina district, the Civil War proved an aid to rice culture in the region of the Mississippi Delta. The cereal had been grown there in but negligible quan-

3. For descriptions of methods in this area during more recent times, see Robarts, "Rice and its Culture," in Popular Science Monthly, 1890, pp. 827–832; Knapp, Present Status of Rice Culture in the United States, U. S. Department of Agriculture, Division of Botany, No. 22, 1899, p. 15; and Mrs. Elizabeth W. A. Pringle, A Woman Rice-Planter, *passim*.

The only noteworthy changes in methods even in pre-Civil-War days to which I have seen reference are "open-trench" planting with "clayed" seed, and the development of machinery for threshing. The former eliminated the task of covering the seed which had been sown in the furrows opened by hoes. Before being scattered, the seed was immersed in a mixture of clay and water, and subsequently dried. A sufficient amount of clay adhered to the grain, so that it stayed unmoved in the trenches after the water had been allowed to flow upon the land. This system of planting, thereafter always followed to some extent in the southern states, is said to have been first introduced by John H. Alston of Georgetown, South Carolina (Ruffin, Agricultural Survey of South Carolina, 1843, p. 107, note).

As to threshing machinery, it may be noted that as early as 1843 a device, said to have been invented in 1830 by Calvin Emmons of New York, was reported "in very general use" for separating the grain from the stalks. Formerly on all plantations, and in 1843 still on many, the "thrashing" was done altogether with the flail; but now this laborious and tedious procedure was being superseded by this machine, driven by animal or even steam power, which separated the grains in much the same way that wheat was "thrashed" — by tooth-beaters which revolved at 600 to 800 times per minute (Ibid., p. 115, and Appendix, p. 18).

tities during the earlier decades; but almost with the outbreak of the war, culture began to increase, and after 1865 a further extension came to the industry. Certain plantations previously devoted to sugar growing were split up into rice fields, when planters of the district, returning to peace-time occupations, found their plantations desolated, their equipment destroyed or dilapidated, and themselves without adequate resources to finance the necessary reconstruction.[4]

By 1880, production had reached some 23,000,000 pounds, or about a fifth of the country's total output at that date, and it had spread to certain areas on the river above New Orleans; but since then this district has made little progress. The richness of the soil and proximity of a super-abundant water supply have enabled the district to withstand competition from regions farther west; but a limitation of suitable acreage and an inability fully to adopt modern production methods have circumscribed the position which eastern Louisiana has been able to assume in the rice-growing industry of the country.[5]

The really striking changes in the cultivation of rice

4. Knapp, op. cit., p. 17. It was also said that less labor was required for rice than for sugar cultivation, and of course labor conditions in the South were difficult at this time.

For earlier production in Louisiana, see U. S. Patent Office Report, Agriculture, 1854, p. 160; and DeBow's Review, 1856, p. 290.

5. Fertility of the soil is maintained by the continual deposit of silt brought down by the Mississippi River; and the water supply is, of course, drawn directly from that stream. At one time, the water was allowed to flow directly upon the rice fields through gates constructed at the river banks. Under this arrangement, however, the growing areas were constantly liable to damage by floods and a new method had to be found. Lately, levees have been constructed along the edge of the stream, and the water required for cultivation is siphoned over them. For a description of the early culture, see Rice Journal, March 1, 1905, pp. 19, 20.

Some indication of the limited adaptability of this area to improved technique is to be found in the fact that harvesting here is still carried through with the hand hook (Farmers' Bulletin, No. 1092, p. 19).

in the United States occur in connection with the next westward advance of the industry, that to southwesternLouisiana and southeastern Texas. In the early eighteen-eighties this area, a prairie region extending along the coast from St. Mary's parish in Louisiana into Texas, was but sparsely settled, and the land was given over to cattle raising. Rice was grown, but only for distinctly local needs, and by semi-oriental methods.[6] Then a railroad was put through, now a part of the Southern Pacific system, and the country opened up. And with the new settlers came the conversion of the land from cattle raising to the cultivation of rice in the extensive manner, that is, with the methods already successfully developed and employed in wheat growing. In place of the old hand-sowing, hand-hoeing, and hand-harvesting, now came the gang-plow, the broadcast-seeder and drill, the disc harrow, and the twine-binder and harvester. The industry was revolutionized. Well might the older districts be startled. A culture which in the Orient had been carried on since time immemorial in a peculiarly intensive manner, and which for nearly two hundred years had been prosecuted in this country on a system as similar to the oriental as conditions would permit, had been modernized in the course of a few years!

The course by which this new technique came into practice in the rice industry is somewhat uncertain. These are the pertinent facts. A certain Mr. Watkins of Iowa, with the aid of English capital, purchased approximately a million and a half acres of land in south-

6. While hand cultivation was employed, no attempt was made to extend the culture, as would probably occur in the Orient, by exceptionally heavy application of labor. The farmers utilized only those limited, low-lying areas in which rain water would collect and remain long enough to mature the crop. From this feature of the local cultivation, the product was generally known as "providence" rice.

western Louisiana, and in 1884 secured Dr. Seaman A. Knapp, then Professor of Agriculture in Iowa State College and later a prominent official of the Department of Agriculture, to assist him in the development of the property. Apparently under inducements from Mr. Watkins and Dr. Knapp, farmers from the northwestern prairie states moved into this Louisiana district during 1884 and 1885; and, finding rice to have been grown there many years for home consumption, tho by primitive methods, they "commenced immediately," wrote Dr. Knapp, "to adapt the agricultural machinery to which they were accustomed to the rice industry." By the close of 1886, continued Dr. Knapp, the principal difficulties in this adaptation had been overcome.[7] But just who was responsible for this exceptionally happy concept, who first put it into execution, when and where — these are questions which cannot be confidently answered. To be sure, one Maurice Brien of Jennings, Louisiana, has been credited with the first use of the twine-binder in rice fields;[8] but others have claimed the honor. Perhaps at this late date one can do no more than give full credit to the goddess of chance: under the circumstances of northwestern farmers newly located in the rice area, someone was bound to combine the well-known technical methods with the novel opportunity.

Whatever the exact origin of this development, the alteration in mode of cultivation was extraordinary. Here there existed large tracts of substantially level prairie, which could be treated in units of much greater size than had been possible in the Carolinas or in the Mississippi region. To be sure, the representative unit

7. Knapp, op. cit., p. 22.

8. S. L. Cary, immigration agent for the Southern Pacific Railroad, in an address in 1899. See Louisiana Rice Book, published by the Company, p. 15.

of cultivation in the former area during pre-Civil-War days, the plantation, had been of considerable dimensions; but it had been split up subsequently into smaller tracts. In the region of the Mississippi Delta, even smaller units prevailed. About 1900 individual tracts ran from one to twenty acres, with units of five to ten acres the most numerous and representative.[9] With either of these districts we may contrast the farms in the southwest, which, according to the census figures at the same time, averaged 45.5 acres, and which typically ran from 150 to 300 acres.[1] And not only was the individual farm larger, but within each farm there were fewer interior ditches dividing the area into separate fields. In place of one- to five-acre fields, here unbroken tracts of forty acres were possible. This meant large-scale operation, surely.[2]

The fields were now prepared for the crop by the gang-plow and disc harrow, and the seed was planted by the drill, or less frequently by the broadcast seeder. The fields then were flooded once for the germination of the seed, and after a few days drained off. When the plants reached a height of six or eight inches, the water was again allowed to overflow the fields, being retained there by surrounding dikes, and it was maintained at the desired height of four to six inches until the grain was ripe. Thereupon the fields were again drained, and as soon as the ground was dry, the crop was cut and tied into bundles by the twine-binder.

9. Knapp, op. cit., p. 18.

1. Again, as in connection with the South Atlantic data (see p. 602, above), the Census appears to have included every farm upon which any rice was grown. Cf. Rice Journal, January, 1909, p. 4, and December, 1916, p. 24, for the acreage of representative farms.

2. Rice Journal, October, 1907, p. 263. It should also be noted that physiographically the land was peculiarly well suited to the rice culture, with convenient means of irrigation in the transfluent streams and with an impervious sub-soil to retain the water upon the fields after they had once been flooded.

Usually the bundles were shocked and allowed to remain in the fields for a time; and subsequently, by use of the harvester "set" in the fields, the grain itself was separated from the stalks. Obviously, there was little utilization of manual labor. And later, with the development of heavy plows and scrapers for throwing up the dikes, still less manual labor was required. As Knapp puts it, "The rice fields were handled like the bonanza wheat farms of Dakota, the main object being apparently to plant a large acreage and secure a certain number of bushels, regardless of quality." More careful methods, to be sure, had subsequently to be adopted, but the section never has lost the characteristic features of the system originally devised.[3]

Moreover, there can be no question about the rapidity of the transformation. Illustrative of the movement is the story told by Dr. Knapp to his son: whereas in one year, presumably 1884 or 1885, William Deering & Company, the Chicago makers of agricultural machinery, shipped a single harvester to the Louisiana rice district, the next season they sent a train of twenty-one cars loaded with their harvesters.[4] And further evidence is available in the data upon production. Altho the state of Louisiana in 1879 had turned out scarcely 23,000,000 pounds of rice, within a decade this figure of production had jumped to 75,000,000 and by 1899

3. Knapp, op. cit., p. 22. The experience of this area in the years immediately following needs only brief comment. At first, the rivers were depended upon for the water supply, and in the early nineties droughts afflicted the section, depressing the ardor of the first cultivators. But another boom in the industry came when, after 1896, irrigation canals with an adequate water supply were constructed. So likewise there came a change in type of rice grown, especially through the introduction, about 1900, of Japanese varieties. This latter point will be touched upon below. Deep wells have also been employed in supplying water to the rice fields, and now a large acreage is taken care of in this way.

4. Letter from Dr. Herman Knapp to the author.

to nearly 280,000,000 pounds, practically all the increase coming from this southwestern area.

The success of rice cultivation in Louisiana under these methods encouraged experiments elsewhere. Perhaps extension of the culture into Texas was to be expected, since the prairie lands which were utilized in Louisiana do not stop short at the state border but run for a hundred miles along the coast from the Sabine River westward. Land which theretofore had been used only for cattle-growing was converted into rice farms in the nineties, and cultivation on the extensive methods above described was instituted.[5] Success seems to have been somewhat less in this area than in southwestern Louisiana, chiefly on account of the nature of the soils. Those of Texas are more tenacious and clayey, and therefore more difficult to work. Certain areas, which bear the fitting title of "hog-wallow land," cannot be successfully cultivated at all unless they are plowed when the moisture conditions are just right.[6] Moreover, production in Texas is less stable. Especially notable is the rather sharp decline in output here between 1909 and 1919, altho production was at the time expanding in Louisiana and other important growing districts. Possibly Texas, or at least important sections of the Texan rice area, may be looked upon as marginal land for rice culture in this general district.[7]

The cultivation of rice, however, spread northward beyond the boundaries of Louisiana. In 1902 a farmer

5. The first production of rice in Texas with the new technique is said to have occurred in Jefferson County in 1895. Texas Department of Agriculture, Bulletin No. 43, p. 91.

6. U. S. Department of Agriculture, Farmers' Bulletin, No. 1092, p. 5.

7. Certain sections of the Louisiana rice region to the north of the original rice district — sections into which rice growing has more recently spread — may also probably be considered marginal land. The difficulty here is that of water supply, since water is less readily available than farther south and can be secured only at greater cost.

named Fuller, who had lived for several years in the more southerly rice districts, and who had sensed the general similarity of conditions near his new holding at Lonoke, Arkansas, to those in the latter areas, began growing rice. The State Experiment Station coöperated actively with Fuller from the first, and within two years had established a branch station in this region. Shortly thereafter the culture had spread through a section of the state called the Grand Prairie and certain prairie lands lying between Weiner and Waldenburg.

The Arkansas conditions have on the whole proved propitious for rice culture, even tho there have lately been some difficulties with the water supply. Production, which had reached nearly 60,000,000 pounds in 1909, had increased more than five-fold by 1919; and in 1925, due in part to a decline in the Texan output, Arkansas had attained the position of the second most important rice-producing state of the Union — second only to Louisiana. Apparently the culture has become a fixed element in the agricultural economy of that area.[8]

Incidentally, — while we depart for a moment from strict chronological order, — note may be made of the very recent expansion of rice cultivation yet farther north. In 1923, experiments were made in the Elsberry district of Missouri, which met with considerable success; and by 1926 the acreage devoted to rice had grown to 9,000 acres, from which a yield of 400,000 bushels was expected. The reported character of this new district, "reclaimed Mississippi River swamp land, suited to no other use," indicates a similarity to the eastern region of Louisiana and even the old fields of the Carolinas, rather than to the "prairie" districts of

8. On the Arkansas development, see Arkansas Agricultural Experiment Station, Bulletins No. 89 (1906) and No. 94 (1908); Perrin, "Arkansas Rice," in The World Today, 1910, pp. 98 seq.; and Rice Journal, especially February and April, 1926.

southwestern Louisiana, Texas, and Arkansas. As one might expect, already difficulties in utilizing heavy machinery have been encountered, tho apparently they are not looked upon in the district as insurmountable. To this may be added the doubt whether the growing season is long enough for advantageous cultivation of the rice plant. Wherefore, despite the promising start, one is justified in holding that the ultimate success of the culture in Missouri is still uncertain.[9]

But the Arkansas development above mentioned had hardly secured firm root before there came a new advance eclipsing it in spectacular quality. In the second decade of the new century, rice culture took a leap from Texas and Arkansas into the Sacramento and San Joaquin valleys of California. To be sure, rice had been grown in Alameda and other coastal counties of the state as early as 1860, but this had been no more than an episode.[1] Modern experiments began about 1908, near Biggs in Butte County, and the first commercial crop came in 1912. Mr. G. C. Henshaw of Jacinto (near Biggs) is sometimes spoken of as "the father of rice planting in California";[2] but even if this

9. Rice Journal, November, 1926, p. 11. Note may also be taken of a tentative cultivation of rice as far north as Lewistown, Illinois. Here a duck-shooting preserve has been drained by pumping, and rice grown "with entire success" (Ibid., p. 12). While the custom among students of rice culture has been to place the northernmost limit of favorable climatic conditions at about 40 degrees or, at most, 44 degrees north latitude, — the most northerly point reached in the existing rice fields (Copeland, Rice, p. 36), — I was surprised to find that Mr. C. E. Chambliss, special expert on rice for the U. S. Department of Agriculture, was not at all certain that this limit might not be transgressed, especially if research should be able to develop rapidly-maturing varieties of rice. Obviously, however, this particular experiment in Illinois is quite too young to support any conclusions upon the point.

I should like here to express my indebtedness to Mr. Chambliss, who was good enough to look over my manuscript and give me the benefit of his criticism.

1. U. S. Department of Agriculture, Department Bulletin, No. 1155, p. 2.

2. Rice Journal, November, 1908, p. 22.

be true in the sense that Mr. Henshaw initiated the recent changes, more substantial credit must go to Mr. C. E. Chambliss, agronomist for the United States Department of Agriculture, who took an active interest in the early experiments, and has done so much subsequently in devising the technique of production and ascertaining the types of rice best suited to the soil and climatic conditions of the new area.[3]

The initial impetus to the development of rice growing in California seems to have come from the existence of lands physically and chemically adapted or adaptable to the culture, which could be acquired at peculiarly low prices. These lands in part were areas which on account of their alkalinity or other conditions had been but indifferently productive for any crop, and in part were areas which, once fertile, had been robbed of their original powers by too-long-continued employment in wheat growing, without proper care for the restoration of the displaced chemical elements. These lands were, or could readily be, supplied with adequate water, were level enough and physiographically conditioned to hold the water on the fields, and were found on experiment to yield excellent crops of rice. More recently, to be sure, especially under the stimulus of war conditions, the rice culture has spread to areas more fertile by nature, encroaching on lands which had previously been profitably sown to other cereals.

In California, large-scale operation and the use of labor-saving devices have been carried even further than in the sections previously described. Farms, or, perhaps better, estates, of 1,000 to 4,000 acres are men-

3. Among other things, Mr. Chambliss was especially active in securing the establishment of the Biggs Rice Field Station, at which most valuable tests have been made in the cultivation of the rice plant in the California environment.

tioned as devoted to rice growing; and, whereas in 1919 the average size of rice farms in the Southwest was reported to be approximately 85 acres, — itself nearly double the figure for 1899, — the average acreage in California was reported as 266 acres.[4] Then, in addition to the apparatus already mentioned with reference to other areas, tractors for a number of purposes, the "checker" and "Fresno scraper" for building levees in the fields, and the push-binder have place in the Pacific cultivation. "Being a new industry," says Copeland, "rice-growing in California has not fallen into grooves of custom, and all sorts of schemes for improvement are constantly being advanced." [5] Indeed, the tendency toward large-scale operations with the use of automatic machinery has been carried so far in California as to occasion some reaction. There is a fairly general feeling that the farms are too large for efficient operation.[6]

Obviously the whole character of rice growing in the United States has been changed during the transit of the producing areas from the Atlantic coast to California. From a primarily hand culture, the industry has changed to one distinctively machine dominated. Already in 1895 it was estimated that whereas, twenty-five years earlier, 62 hours of manual labor were required to cultivate an acre of rice by the old hand method, only 17 hours of human labor were needed under the improved technique.[7] These figures, to be

4. Mr. Chambliss thinks the Census figure for the Southwest is much too small to be representative, but that the California figure is more nearly typical. The representative "ranch" is larger in California, but not in the measure suggested by the above figures.

5. Copeland, op. cit., p. 205.

6. Tariff Hearings, House of Representatives, 1921, pp. 1669, 1670; Copeland, op. cit., p. 205.

7. Thirteenth Annual Report of the Commissioner of Labor, 1898, ii, 454–455.

sure, are far from accurate, but there was, I suspect, a decrease of labor hours somewhat in the proportion here suggested.[8] It is unquestionable, too, that curtailment from the conditions of 1895 has been made possible by subsequent improvements in machinery and method. "The tractor is more universally used in rice production than for any other crop," says the Agricultural Yearbook for 1922, and apparently with respect to certain other types of apparatus the rice-growing industry compares favorably with that of any other agricultural activity.[9] It must not be thought, however, that rice growing is by any means as economical of labor as certain other grain cultures. Estimates of the United States Department of Agriculture indicate that, while rice production uses from 35 to 43 hours of direct human labor per acre of crop in the chief growing districts of the country, winter wheat requires something like 12 man-hours, oats 13, and rye 17 man-hours.[1] Comparison on the basis of the weight of crop yielded per acre would be more favorable to rice, but the discrepancy suggested in the above figures would not be altogether overcome. The care required in preparation of the soil for the seed, the need of continued attention to ditches and levees, and the attention necessary to the maintenance of proper moisture conditions on the fields, all occasion expenditure of labor to an extent not needed for other cereal crops. None the less, advances in the saving of labor have been extraordinary in American

8. The Yearbook of the Department of Agriculture in 1922, p. 556 gives the labor hours per acre of rice as then varying from 35 to 43 in the chief rice-growing districts of the country.

9. Ibid., p. 566.

1. The above figure for rice seems high to experts. Probably 30 man-hours per acre would be more correct. The data for the other crops are taken from the Yearbook, 1921, pp. 811, 812, and represent averages for several growing districts or states within the country.

rice growing and must be taken into account when the question of comparative advantage is considered.[2]

The results of the many changes above described and the historical development of the American rice-growing industry are manifold. For example, the total domestic output of rice has risen by leaps and bounds, especially since 1889. From the low point of approximately 90,000,000 pounds of domestic output reached in 1869, there had indeed been an advance to nearly 130,000,000 in the next two decades, due chiefly to the expansion of production in the region of the Mississippi and to the beginnings of cultivation in southwestern Louisiana. But since 1889, production has not failed to increase at least by 50 per cent in every decade; and over the thirty-year period prior to 1919, the advance has been roughly twelve-fold, until at the latter date nearly 1,600,000,000 pounds came from domestic sources.[3] Incidentally, too, it is worthy of note that present-day production is probably many-fold that of the country at any previous period, running, for example, something like seven- or eight-fold that reported for the decade just prior to the Civil War.

2. Of course, the conditions of labor cost are not conclusive, as any student of comparative advantage appreciates. Illustrative of this point is the evidence reported by the Department of Agriculture relative to California cereal crops in 1919–21 (Farmers' Bulletin, No. 1240, p. 2). "Rice sown on one-eighth the average barley acreage has produced nearly half as much agricultural wealth. Sown on less than one-fifth of the average wheat acreage, rice has produced nearly two-thirds as much agricultural wealth."

3. By decades 1869 to 1919, total production was specifically as follows in millions of pounds.

1869	89	1899	405
1879	133	1909	983
1889	129	1919	1590

To be sure, production in the last few years has averaged something like 25 per cent below the 1919 level; but still the quantity of domestic output remains approximately 50 per cent greater than pre-war figures.

The extension of cultivation to the West has been accompanied by an actual as well as relative decrease in eastern production, until in recent years the position of the old famous Carolina area has become negligible in comparison with the aggregate domestic rice-growing industry. Whereas, as late as 1879 South Carolina and Georgia together produced approximately 90 per cent of the total American crop, the figures of production in 1919 indicate the share of the South-Atlantic states to have been less than one per cent of that year's total.

The combination of new technique and virgin soils in the western producing areas was directly responsible, it appears, for the decline of the Carolina district. Already by 1905 the essentials of the situation had come to be widely recognized. During the preceding few years, said the Agricultural Yearbook of that date, the price of rice had fallen so low, owing to the "enormous development of production in Louisiana and Texas," that many rice growers in the South-Atlantic area had been compelled to abandon their lands; and in 1908 the industry in this latter region was said to be in a "precarious" condition.[4] Now the Carolina culture may be said to have passed into history — gone. Production on a semi-oriental system could not withstand the competition of the newer districts — and no internal tariff barriers existed to "protect" the Carolinian farmers.

As time went on, the west-south-central states came to dominate the industry. In 1909, their contribution had become 96.7 per cent of the aggregate domestic crop; and since that date the production in Louisiana, Texas, and Arkansas has increased appreciably. Mean-

4. Yearbook of the U. S. Department of Agriculture, 1905, p. 200; Ibid., 1908, p. 356.

while, however, the California development has occurred, and the proportion of the country's total crop coming from the Southwest has shrunk to approximately 80 per cent. At present, then, the national output of rice is divided for all intents and purposes between the two areas of the Southwest and California, with four fifths supplied by the former and the other fifth by the latter.

Finally, as part and parcel of the westward trend of the domestic rice culture, there has come a steadily mounting yield of the crop per acre. From an average of 22.7 bushels or approximately 1020 pounds per acre in 1879, the productivity for the country as a whole has risen, until in 1919 it reached, according to the Census data, 38.8 bushels, or 1,750 pounds. The explanation of this rise is in large measure to be found in the opening-up of new areas of cultivation and the treatment of new soils; but to some extent, at least, it is to be found in the continuing advance of yields in districts such as Louisiana, which are now hardly to be classified as virgin lands. In the latter case, increase has been due predominantly to improved technique, including better seed — not, in a significant degree, to more intensive methods of cultivation, the use of fertilizers and the like. That both factors, new soils and advancing technique, have played important rôles in the development is apparent in the following tabulation:

AVERAGE YIELD PER ACRE IN BUSHELS

	1889	1899	1909	1919
South Carolina and Georgia	16.5	21.1	26.6	17.1
Louisiana	32.2	30.8	34.1	35.0
Texas	21.9	26.7	37.8	32.3
Arkansas	28.4	12.4	46.8	47.5
California	..	..	..	53.1

Annual figures, prepared by the United States Department of Agriculture and available for the period since

1904, tell a similar story in so far as the last twenty years are concerned.[5] The greater productiveness of the Southwest relative to the old Atlantic area is clear; and not less clear are the still larger yields of the Arkansas and California districts yet more recently brought under cultivation. Moreover, not only is a notable increase apparent in the yields for the several regions individually considered, but it would seem that the advance has not wholly ceased. Except for South Carolina and California, the yields for the crop seasons since 1920 have averaged higher than those of the pre-war or war-time years. This has occurred despite the extension of cultivation that occurred during the war, encouraged by mounting prices and opening export trade, and despite the subsequent relapse of prices in the later years, together with a curtailment of exportation.

In sum, then, the development in the American rice-growing industry during recent decades has been revolutionary. Despite conditions which would seem to hamper and confine the culture, there have come a thorough-going overturn in technique of cultivation; a complete, or virtually complete, redisposition of produ-

5. The evidence of the U. S. Department of Agriculture's figures is well worth presenting in summary form. The data run in terms of average yield in bushels per acre, as follows:

	1904–08	1909–13	1914–20	1921–25
South Carolina	24.8	22.7	23.0	22.0
Louisiana	29.0	32.4	24.9	34.7
Texas	33.8	33.8	33.9	36.7
Arkansas	39.4*	38.5	44.7	45.8
California	..	42.7†	60.5	51.9
Total United States	30.9	33.3	37.9	38.7

* For the four years 1905–08 only.
† For the four years 1910–13 only.

It may be noted, for purposes of comparison with data given in terms of pounds, that a bushel of rice is usually taken as equivalent to 45 pounds.

cing areas; and, as a consequence of both these factors, an astonishing increase of total domestic production together with rising quantities of output per unit of producing acreage. Taken altogether, the development seems indeed to warrant the assertion already quoted, that "the production of rice has probably undergone greater changes than that of any other crop in the United States." [6]

II

When we turn to the international aspects of the subject, — the question of the comparative advantage of the American rice cultivation in international trade, — we find a course of developments nearly as spectacular as that of internal expansion itself. Here the most outstanding change relates to the control of the domestic market. Let us dip back into history for a moment. The United States ceased to be a rice-exporting nation, at least on balance, with the outbreak of the Civil War. Carolina rice, to be sure, continued to be shipped abroad, where it held a market without direct regard to price conditions because of its exceptionally high quality; but, in terms of bulk, imports came to exceed exports. With the growth of population within the country and no comparable increase in rice cultivation, the imported commodity came, despite the higher tariffs of the post-Civil-War period, to have a larger and larger hold of the local market. Even as late as the nineties, when some advance in domestic production had already occurred, imports of cleaned rice equaled something like fifty per cent of the country's total consumption.[7] But

6. Cf. above, p. 596.

7. Knapp, op. cit., pp. 8–10. Throughout this discussion of imports and exports, no consideration is given the movements of rice meal, flour, broken rice, and polish. These are essentially by-products of the rice-milling industry, and their flow into or out of the country is sub-

in recent years imports have been slight. As compared with an average domestic yield of 1,620,000,000 pounds of rough rice during 1921–25, importations in terms of rough rice equivalent amounted to less than 42,000,000 pounds, or really a negligible quantity. The continuance of any shipments at all to the United States in these years is, indeed, to be explained by special conditions of quality. Rice is imported now, as in some measure it was exported earlier, largely without direct regard to price. A particular variety of rice, called patna rice, not grown in this country, is required by the manufacturers of canned goods, since only this type will stand the high temperatures (for example, in cooking soups) and not lose its form.[8] Certain varieties of the article, again, are demanded by the Chinese, by the Japanese in Hawaii or on the Pacific coast, and by the Italians, Spanish, and Jews in the eastern part of the country. Such special demands account for most, if not all, of the inward movement of rice.

Even more surprising than the acquisition by the domestic industry, behind the wall of the protective tariff, of domination in the domestic market has been the growth of an export trade, and an export trade which

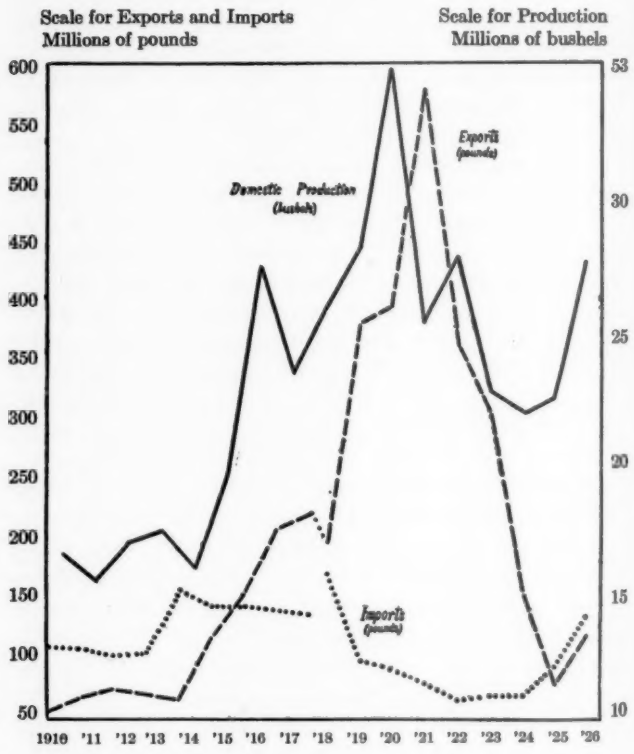
ject to forces quite different from those dominating in the commerce of whole-grain or "head" rice.

In handling the statistics of production and importation, it is necessary to use some approximations. Domestic production of rice is customarily reported in terms of rough or unhulled rice, while imports for consumption are reported under the several headings of cleaned rice, uncleaned rice, and paddy or rough rice. To make the two sets of figures comparable, I have converted both to a cleaned-rice basis, by assuming that two pounds of cleaned rice are secured from three of rough, and nine of cleaned rice from ten of uncleaned. See U. S. Tariff Commission, Dictionary of Tariff Information, p. 627.

8. That patna rice is largely non-competitive with the domestic product is suggested by the fact that it is included on the free list in the tariff act of 1922. While there is some small domestic production of rice which would satisfy the requirements of the canned-goods manufacturers, the supply is insufficient and somewhat undependable.

has at times carried our rice in substantial volume back to the ancient home of rice growing, the Orient. This outward trade admittedly is of relatively recent origin and, viewed in the most favorable light, it has yet to prove itself under normal post-war conditions. But the mere fact of exportation, even tho only an episode, is suggestive of the position of the rice culture relative to other American industries. Exports to Porto Rico, Hawaii, and other non-contiguous American possessions, of course, came earlier and as an incident to the circumstance that the whole area has come within the national tariff barriers. Real exportation, that is, to foreign countries, was chiefly a phenomenon of war-time development. In the pre-war years, barring an occasional twelve-month, as for instance 1900 or 1905, such exports amounted to but 3,000,000 or 4,000,000 pounds of "grain" or "head" rice per annum. In 1911 — and this date is of some significance — exports began to increase; and they averaged over 20,000,000 pounds in the four years 1911–14. Yet this was after all a small affair quantitatively, exports being less than a third of the contemporary importations; and its importance is further diminished by the consideration that the chief foreign purchasers of our rice were close neighbors, — Cuba and Central America, — in shipments to whom our merchants had the advantage of low transportation charges as compared with their competitors of the Orient. Still there seems to remain "some" significance, as I have suggested. While the industry had not crossed the line between comparative advantage and disadvantage, it had moved up close to that line. An industry that is laboring under a heavy degree of disadvantage — for example, the domestic cotton-lace or sugar-growing industry — does not export at all.

Whether the experience of 1911–14 be considered a forecast of change or not, the fact remains that since this date exports have not again fallen so low. As is indicated by the accompanying diagram, export-



ations mounted rapidly after 1914, until in the calendar year 1921 they reached the astonishing total of 600,000,000 pounds (cleaned rice). Meanwhile — or, specifically, by 1919—they had come to exceed the

volume of imports (reduced to a comparable basis of cleaned rice), and after that year steadily overbalanced the reduced inflowing quantity of importations until 1925. In 1925 and 1926, the movements of exports and imports were difficult to interpret. Imports advanced sharply and surpassed exports. On the other hand, 1925 was a poor year for the domestic rice crop, especially as far as quality of output was concerned; and 1926 showed an increase of exports proportionately greater than the increase of imports.

The marked decline in our export trade since 1921 may indicate evidence that the war-sprung overturn in our foreign trade in rice was a mere episode, not the initiation of a new period in the history of the industry. But the problem is to be placed in the broad setting of the whole competitive position of our rice-growing production — a problem which brings to the fore various points of interest in the struggle of a typically Americanized agricultural production with a typical oriental industry.

One important factor favoring the domestic industry is the high adaptability and reliability of rice culture. Within certain limits set by temperature conditions, and subject to the one proviso that adequate water supplies be available, rice can be grown, it is said, upon almost any soil. Adequacy of water supplies, to be sure, entails for practical purposes the need of an impervious sub-soil below the rice fields, to conserve the water with which the area is flooded from time to time. This physiographic element must be considered in the selection of advantageous rice-growing districts. But given this not uncommon soil structure, rice is readily adapted to any particular environment within the temperature belt. And the dependability of the crop is also a consequence of the dominating control of water

in its cultivation. Rice is, of course, susceptible to damage by showers during the pollination stage of growth, and surely is seriously harmed by storms during harvesting; while, like all plants, it is subject to various diseases. On the whole, however, rice seems liable to fewer vicissitudes than most cereals, and, as Knapp and Copeland both assert, may be regarded as "the most reliable of all cereal crops." [9] This circumstance seems a peculiarly potent feature in aid of the domestic cultivation. Reliability of crop, so conspicuously absent in the case of many agricultural undertakings, may be looked upon as corresponding to standardization of product in manufacturing industries. The regularity of the enterprise is greatly increased. Accordingly, capital investment in the form of machinery and huge irrigation works is fostered, and to some degree advantage from the relatively cheap capital in this country goes to counterbalance disadvantages of other sorts. The competitive position of the industry is improved.

Secondly, when considering physical conditions, one should make note of the continuing fertility of American soils. This factor, of course, is of no permanent significance, but in the years immediately ahead, beyond which this discussion could not profitably go, it may be allowed as a matter of real importance in the determination of American comparative advantage. Yet I need not labor this point. Suffice it to contrast the fact that, with the exception of the Carolina and Mississippi River districts, domestic rice-growing areas

9. Knapp, op. cit., p. 27; and Copeland, op. cit., p. 43. Copeland says: "Alone among the world's great crops, rice grows typically in a field of standing water. . . . Ideally . . . this water is provided and regulated by the grower; irrigation is the technique of rice culture. . . . Water so dominates over other climatic factors, that, with good irrigation facilities, rice must be recognized as the safest of the world's great crops."

have not hitherto felt the necessity of employing artificial fertilizer upon any noteworthy scale; whereas an extraordinary amount of labor is expended in oriental rice cultures upon the procurement of fertilizing material and its dosage upon the land.

Whatever natural advantages the country may possess have been strengthened by the acquisition and utilization of varieties of rice specially suitable to American conditions. The "Carolina gold" and "Carolina white" varieties dominated the Atlantic rice production in the years of its ascendancy. These were rices of high quality; but they were found less well suited to western climatic and soil conditions, and new types came in time to replace them. Another long-kernel rice, the "Honduras," was brought into use when the rice culture expanded into the valley of the Mississippi. But again neither this nor the Carolina type was found advantageous in the prairie cultivation of the Southwest, in Arkansas, or in California; and the world was searched for more suitable varieties. In this matter, it should be recorded, the United States Department of Agriculture has made conspicuous contributions, both in locating and in testing new types. Special success in private as well as governmental activities has crowned experiments with Japanese rices and with rices of the characteristic Japanese sort — short-grained varieties. In the end, such important types as Wataribune and Blue Rose have been acquired and brought into general use in this country, adding much to the competitive strength of the domestic industry.

One requirement which has played a prominent rôle in the choice and general adoption of the varieties finally adopted has been the capacity of the rice to stand the relatively hard usage involved in harvesting and threshing by machinery, and to remain unbroken

under modern methods of machine milling. The rice must not shatter in the transit from standing grain to threshed product; and again, it must yield a high percentage of whole-grained or "head" rice in the transit from rough to polished condition. That success has been attained, at least in the latter connection, is evident from the Census data on rice milling, which show the relation in volume of cleaned-rice product to that of rough-rice raw material. There has been a steady advance in the proportion of head rice produced to rough rice milled since the date when such a figure was first presented—1899. In this year, the average for the country was 60 per cent, and since then each semi-decennial Census has indicated an improvement, until in 1919 the ratio had become 66 per cent. In part, to be sure, this advance has been made possible by improvements in mill equipment, but selection of seed has been of equal, if not greater, importance. The recent drift toward the wider growth of the rice called Blue Rose is attributable largely to the desire for a product with higher milling qualities.

The milling process itself, it may be added, is the sort of operation that fits well with American conditions. The hulling of the rice was once carried through by hand on domestic plantations, as indeed it still is, to a large extent, on oriental farms. But, even before the Civil War, "pounding" mills had been established in the Carolina district, first at the plantations (tide-mills), and later at central points such as Charleston, for the treatment of the local crop. The mills of this period were crude affairs, employing, as their name suggests, apparatus of the mortar-and-pestle variety, driven by water power, to separate the husks from the grain. Gradually here and elsewhere in the country, the technique of milling by machine has been improved,

until it has reached a stage of automatic operation comparable with flour milling. "The system of milling is so complete," wrote an observer some years ago, "that from the time the rough rice is poured into the receptacle at one end of the building, it is not touched by hand until the finished kernels, the hulls, and other products are taken from the bins at the other ends." [1] Meanwhile the size of the individual milling establishment has in creased somewhat, with the improvements in transportation and with the recognition of the advantages in a larger scale of operation. Despite the extraordinary expansion, quantitative and geographic, in the rice-growing industry, within the period for which data are available — 1899–1919 — the number of rice mills has scarcely increased at all. In 1899, there were 80 establishments in the United States, with a total of 651 wage-earners, or an average of approximately eight persons per establishment; whereas in 1919, there were but 86 such plants, with a working force of 2113 wage-earners, or an average of over 24 per establishment. Since substantially the whole rice crop of the country went through these mills, — some 35,000,000 bushels of rice, — it is apparent that the process has been reduced to a highly automatic basis. Preparation of the crop for marketing entails no handicap to the American rice production.

Finally, the quality of the domestic product gives it a position of advantage in competition with potential

1. Willey, "Rice Culture in the Southwest," Gunton's Magazine, 1904, p. 186. It must not be imagined, however, that the rice-milling technique was borrowed from the flour-milling industry. In fact, the two processes aim at directly opposite results, — one to maintain whole grains and the other to pulverize the grains as thoroughly as possible, — and the machinery employed differs correspondingly.

For improvements in the technique of milling, especially the "recent" substitution of the huller for the old power-driven mortar and pestle, see Dr. Knapp, in Farmer's Bulletin, No. 110, p. 21.

importations. Something of the position and high reputation acquired by the Carolina producers of the pre-Civil-War period has been retained in the modern industry. When, in 1920, the British Imperial Commission was examining the possibility of extending the market for Indian rice, it made the remark that the domestic American product "is of exceptionally high quality, and it is unlikely that any considerable market for Indian rice could be found in the United States, unless the cultivation of the home-grown, high-quality rice becomes unprofitable." [2] And similar expressions are elsewhere to be found.[3] This circumstance is a real protection, at least of the home market, and gives to the export trade a certain advantage, at any rate in a limited section of the foreign market. Incidentally, too, it may be remarked that the variety of rice produced in the California area — the short-grained rice, directly or indirectly of Japanese origin — is the only variety which has achieved ready acceptance in the import trade of Japan.[4] At the time when substantial exportations were being made to that country, American rice sold on an equal basis with the domestic Japanese product, and at a premium over other foreign rices.

Against this group of factors which seem conducive to effectiveness in the American rice-growing industry, there appear to be but two countervailing elements of any considerable importance, a certain peculiar adaptability of rice culture to eastern climatic conditions and

2. Imperial Institute, Indian Trade Enquiry, Reports on Rice, 1920, p. 14.

3. Rice Journal, May, 1926, p. 39: "Despite the fact that American rice is (in foreign markets) frequently twice as expensive as other types, it is always in demand and is considered the best in the market."

4. Rice of similar character could be grown in other American districts; but on account of the particular geographical and marketing conditions, the Californian product is the only one that has ever reached the Japanese ports in any substantial volume.

the markedly lower standards of living of the people in the Orient who there carry on the cultivation of rice. The natural factor particularly favorable to the Oriental rice culture is almost exclusively the heavy precipitation which in many areas lightens the burden of the important rice-growing problem of the water supply. Throughout eastern and southeastern Asia, the first condition of rice culture in its early stages is said to be the utilization of the rainy season which follows the change of monsoon in the spring. Moreover, while artificial irrigation plays an important rôle in large sections of the East, certain rice-exporting districts, such as the Burma delta in India and parts of Siam, have sufficient rainfall to inundate the fields without aid from artificial sources.[5] With such conditions may be contrasted the highly organized systems of water supply employed in the producing areas of the United States, which, tho peculiarly efficient by themselves, are hardly costless.[6]

5. Bulletin of the Imperial Institute, vol. XI, pp. 639, 643.

6. The provision made in domestic rice areas for water deserve more attention than I have been able to give the subject here. While certain districts, such as the low lands along the Mississippi River in Louisiana and Missouri, are supplied chiefly by water siphoned from the river itself, elsewhere, as in southwestern Louisiana, the water supply involves an engineering problem of much magnitude. The water is pumped from rivers or bayous which generally lie below the level of the prairie land to be irrigated. Since the pumping machinery is usually designed to provide 7½ gallons of water per minute for each acre to be watered, and since the height through which the water must be elevated varies from 10 to 80 feet, one may well believe that this work employs "some of the largest and best equipped pumping plants in the world" (Texas Department of Agriculture, Bulletin, No. 43, p. 91). In other cases, — e.g., Arkansas, — most of the water is supplied by deep wells. Since the quantity of water needed is approximately the same as in Louisiana, obviously the digging of wells of adequate size also requires the expenditure of much capital. This leads sometimes to unwise economizing on the number of wells, until "hundreds of acres of rice are lost each year because most wells are too heavily loaded" (Rice Journal, April, 1926, p. 33). Finally, in addition to the substantial capital investment in pumping apparatus and wells, and to the losses from overloading, a further disadvantage to the domestic producer, connected with the water supply, may be mentioned: that rice farmers are charged

On the whole, however, especially by reason of the wide adaptability of the rice plant, this natural factor is not definitive and controlling. The competition between domestic and foreign producers is chiefly one of "high farming" with machinery and large-scale methods, and intensive cultivation by the "unnumbered millions of the Orient" — to quote a recent petition for protection — "who subsist upon a handful of rice and wear little clothing except a breech cloth." [7] The real question seems to be whether the utilization of capital, fertile lands, and large-scale methods in the American industry increases its effectiveness sufficiently to make up for the difference in real income between the domestic farmer and laborer and their eastern counterparts.

Of the general character of the oriental rice culture, little more need be said here. It has long served as a striking illustration in economic discussions of the typical form of eastern industry, and it has become an intimate part of our imagery regarding eastern civilization — the Chinaman or Japanese squatting in the muddy rice field; the coolie patiently working the treadmill to raise water to the height required; and the terraced slopes that conserve every available foot of land and make possible repeated use of the precious water supply.[8]

for water through some form of crop rental, instead of in accordance with the amount of water actually consumed. This is viewed by some observers as an important item in placing the domestic grower at a disadvantage in the world trade. U. S. Department of Agriculture, Farmers' Bulletin, No. 1356, p. 20.

7. Tariff Hearings, House of Representatives, 1921, p. 1721.

8. Let a single description suffice, one of recent date, based upon the Japanese culture and so rather advanced by oriental standards: "Much of the work is heavy. Because the fields are so tiny and because it is necessary to keep them in the finest possible condition, very little animal power is used. The rice fields must be worked standing in the mud, sometimes to the ankles, sometimes to the knees, and in certain districts, almost to the hips. . . . The rice is weeded and the ground, or mud, stirred about three times during the summer. Much of this

Yet, however familiar the oriental practices may be in general outline, certain features deserve special mention here. First, it is to be noted that the representative unit of production is small, the acreage in oriental countries devoted to rice growing being divided into small plots, each of which is worked by an individual or by a man and his family. As compared with the hundred-and-fifty or three-hundred-acre farm in the southwestern section of the United States, or with the five-hundred to one-thousand-acre "ranches" in California, the typical rice plot in the Orient is tiny. For instance, it is estimated that in 1910, 70 per cent of the Japanese farmers cultivated less than one cho (2.45 acres) apiece, and only 3 per cent cultivated more than three cho (7.35 acres).[9]

Secondly, the application of labor per unit of land is extraordinarily high. The greater part of the work is done by hand, especially the planting, nurture, and harvesting. Plowing, to be sure, is carried through rather generally by the aid of buffaloes, — and there is even an occasional mention of the use of tractors in very recent years,[1] — but the employment of draught animals is by no means universal. Where the land is particularly heavy or where it is highly terraced, their use is inconvenient or impossible, and in other places the

is done with the naked hand. . . . Harvesting and threshing make slow, laborious tasks for muscles alone." Buchanan, "Rural Economy of Japan," in this Journal, 1922–23, pp. 558–559.

In this connection, it may be noted that sometimes rice growing is spoken of as unsuited to the temperament of the typical American agriculturalist. For instance, the domestic culture is reported to be "a roughneck game" in which the farmer "must fight mud, weather, machinery, and mules" (Tariff Hearings, House of Representatives, 1921, p. 1668). Yet apparently such statements are exaggerated. Rice cultivation on the whole is not strikingly different in these respects from various other branches of agriculture, except perhaps an occasional problem with heavy mud.

9. Imperial Institute, Reports on Rice, p. 110.

1. Bulletin of the Imperial Institute, xi, 646.

cost of the animals or the restricted area of the individual rice plots checks their employment.

At the other end of the production process in the East, however, — preparation of the rice for market, — machinery has begun to play a somewhat significant rôle.[2] Mills for the cleaning of rice exist widely in all the important rice-exporting countries, altho apparently the rice grown distinctly for local consumption in the interior of such countries, as well as in areas elsewhere which do not produce a surplus for exportatioin is still hulled by the old hand pestle and mortar. Mills of substantial size are reported in India, Siam, and Cochin-China, especially in districts tributary to the great ports of exportation, while smaller establishments seem to dot the more important riverways. While such mills may lack the efficiency of American enterprises of similar character, they cannot fail to add to the advantage of these districts in world competition, if only that thereby a more uniform product is secured.[3]

Yet, despite the frequent employment of bullock-drawn plows and the widening use of cleaning mills, the statement is still true that "the greater part of the work is done by hand." Thus the practice obtains almost universally in the Orient of transplanting seedlings of rice, previously nurtured in special beds, into

2. Occasionally also there is mention of binders and threshing machines in use in certain sections of the Orient, tho on account of the inefficiency of labor in handling such machines and the competition of cheap labor, the employment of this apparatus is relatively infrequent. Copeland, op. cit., pp. 253–256; Sluyter's Monthly, May, 1922, p. 353; Philippine Islands Bureau of Agriculture, Bulletin No. 37, p. 45. Almost universally threshing is accomplished by the use of flails, or by submitting the grain to the tread of oxen.

3. U. S. Department of Agriculture, Farmer's Bulletin, No. 110, p. 20; Mysore Economic Journal, May, 1917, p. 248; Bulletin of the Imperial Institute, (1912), xii, 93; Rice Journal, December, 1916, p. 26; U. S. Consular Reports (1917), lxxvii, 36; Philippine Islands, Bureau of Agriculture, Bulletin, No. 37, p. 45.

the rice fields proper — a practice never resorted to in the United States. This method is supposed to be advantageous in securing a more uniform stand of the crop and a larger yield, and in permitting later planting in the field. After transplanting, hand labor keeps the fields clear of weeds. Similarly, harvesting and threshing are hand operations, the use of labor in the former being carried so far that throughout many areas the heads of grain are cut one at a time. "No machinery yet invented," writes an eastern observer, "is capable of either transplanting or harvesting on wet ground, or successfully cutting a good crop of rice which, if heavy enough to be profitable, falls to the ground.[4]

Again, as regards the general nature of the culture, it may be noted that, as already suggested, the whole family of the cultivator is usually employed in the fields; and the intensive character of the rice cultivation is further heightened by continuous cropping of the land as in India or Java, by the cultivation of two crops of rice a year as in Indo-China, or by the growing of some alternate crop in the off-season as generally in Japan where conditions will not support unremitting devotion to rice.

Still another element must be taken into account — a result of this typically oriental culture. However meticulous the method and however intensive the application of labor, the yield in garnered grain is the decisive matter; and here the observer is struck by the fact that productivity per acre is by no means proportionate to the peculiarly great expenditure of labor. Reports from the Philippines covering a decade indicate yields running generally from 13 to 20 bushels of rough rice per acre; and the average for all of India from 1912–13 to 1916–17 is placed at less than 27 bushels. Indeed,

4. Sluyter's Monthly, May, 1922, p. 352.

17½ to 25 bushels an acre probably can be taken to cover the normal output in large sections of the East.[5] In particular areas, to be sure, the yields are appreciably greater. The output in Siam, for instance, is supposed to run about 37 or 38 bushels an acre.[6] In four important provinces of India, including Burma, the average production per acre was reported in 1908 as approximately 48 bushels, while more recently the output in Lower Burma — the region specially endowed by nature for rice growing — was stated to run from 33⅓ to nearly 90 bushels.[7] Again, in Japan, where the cultivation of rice has been carried to the greatest intensity, the average yield per acre for 1920 was reported as 93⅓ bushels — an extraordinary figure.[8] With such productiveness may be compared the output per acre in the United States — either the 38.8 bushels (approximately 1750 pounds) which was the average in 1919 for the whole United States, or the 53.4 bushels (roughly 2400 pounds) which was the average in 1921–24 for California, the most fertile region. Obviously, hand culture in the Orient does not necessarily mean the attainment of yields equaling or approaching those secured in the United States, altho in some important areas it may do so.

Even the large yields reported for certain specially productive regions become less significant when they are directly related to the amount of labor employed in the Oriental and American cultures. "On the prairie rice lands of Louisiana and Texas," wrote Dr. Knapp as early as 1899, "one man with a four-mule team can plant and harvest a hundred acres of rice. He will re-

5. Sluyter's Monthly, April, 1922, p. 266; Imperial Institute, Reports on Rice, p. 73.

6. Imperial Institute, Reports on Rice, p. 122.

7. U. S. Consular Reports, February, 1908, p. 52; Imperial Institute, Reports on Rice, p. 79.

8. Copeland, op. cit., p. 297.

quire an additional man in harvesting and stacking, and, of course, help for two or three days in threshing. Well tended, his crop will net him a thousand barrels (or 162,000 pounds of rough rice).[9] . . . In Japan, one third of an acre is a reasonable rice farm for a man. In China and India, the water buffalo is used in preparing the land, which enables one man to cultivate half an acre to two acres, depending upon the amount of additional help employed."[1] If we assume the labor cost per hundred acres in the United States to be equal to two men continuously employed, and the yield of rice for Japan that mentioned above, one finds production per man in the two cases to be, respectively, 81,000 pounds and 1,400 pounds. Probably these particular figures are quite unreliable, but if there exists anything approaching a fifty- or sixty-fold excess per man of domestic over Japanese production, the figures of yields per acre must not be taken too seriously.

The nub of the competition with oriental rice, however, consists in the scale of return secured by the cultivators themselves and the forces that determine that return. In the East a situation prevails which contrasts sharply in at least two respects with that obtaining in the United States. First, altho here the production of rice is carried on largely by hired labor, in the Orient the work, as above intimated, devolves normally upon the farmer alone or upon him and his family or neighbors. Accordingly, a direct comparison of wage scales, even if fragmentary data be available for certain districts of the Far East, is not very enlightening.[2]

9. This is based on a yield of 36 bushels per acre, a figure not much at variance with the average for Louisiana and Texas.

1. Louisiana Rice Book, pp. 44–45. For other figures of Dr. Knapp, see Farmer's Bulletin, No. 110, p. 19.

2. Since such oriental wage data as are available give some suggestion of the position of the Eastern cultivator relative to his American competitor, I present the following: Wages for farm laborers in Japan

Secondly, the level of wages in the American rice-growing industry may be considered as set by agricultural and industrial activities in which the country has a sustained and substantial comparative advantage — a standard which the rice farmer here must meet if he is to pursue his cultivation. The return of rice culture to the oriental agriculturist, however, must be looked upon as a resultant of his activities relative to conditions in the world's rice trade. His return is a function of world conditions, rising and falling as his relative position improves or worsens — and this for the reason that in much of the area in the Orient now given over to rice growing, this cultivation apparently is the industry of greatest comparative advantage.[3] It is this cultivation that sets the pace for all other industries. Only a marked diminution in the return securable from rice cultivation, — one so marked that it would bring the return down to or below the level of that obtainable from the next most advantageous and alternative crop; or, on the other hand, an increase in the return from the latter, while the absolute position of rice growing remained unchanged, — only one of these events would be likely to divert the oriental cultivator from his present line of activity. Such an event as the appearance of American exports of rice in the world trade

— an average for all districts — were reported in 1923 as 38 and 27½ cents a day for men and women, respectively, in the case of a yearly contract; while in the case of a day-to-day contract, the rates were respectively, 79 and 60½ cents for men and women (Japanese Yearbook, 1927, p. 354). For the Philippines, farm labor was said in 1922 to get the equivalent of 26 cents a day (Sluyter's Monthly, March, 1922, p. 186).

3. This condition is indicated by the importance of rice in the export trade of the chief countries of surplus production. Thus, in Indo-China, rice and its by-products represent 65 per cent of the total value of that country's exportations (Indo-China, Bulletin Economique, No. 28, 1925, p. 163); while of Lower Burma it is said that "there are no competing crops in the great rice-producing area" (Copeland, op. cit., p. 267).

— even to a considerably greater extent than as yet has occurred or now seems probable — would tend to have the effect only of enhancing competition in that trade, reducing world prices in some degree, and ultimately diminishing the returns to the eastern grower. It would not induce him to abandon production, barring, as I have suggested, a radical alteration in his real gains. But meanwhile the profits to the American producer from his export trade would have declined. Apparently the latter is confronted with a confining wall of great resiliency. His competitor may be hurt, but his own position is not improved.

Something of this notion, with other features included, is expressed by Mr. L. P. Hill, a rice grower of the Philippines, in a recent article. Regions of intensive cultivation, he says, are regions of small holdings; and small holdings make for immobility of labor. In turn, this immobility of labor leads to stability of agricultural conditions and steady production. "In the Occident, agriculture is a profession, but in the Orient it is an inheritance." Accordingly, whereas the Occidental labors to secure more comforts and a higher standard of living, the Oriental struggles for mere existence.[4] Translated into terms of formal economics, this would suggest that the conditions of oriental cultivation give inelasticity of supply, in the sense that variation in reward makes little difference in the amount of the article produced.

One possibility of escape remains, but apparently only one — a growing deficiency in the world crop relative to world demands. Such a deficiency might so raise the value of rice that, barring no change in the position of domestic production relative to other industries, and no change in our equation of exchange with the

4. Sluyter's Monthly, March, 1922, p. 185.

world at large, we might be enabled to export rice profitably. Another way of putting the matter — less accurate, I think — is that the margin of cultivation for rice in the world may be extended until the American output comes within the new margin. And something like this is not impossible. What, then, are the chances of such an outcome?

Some evidence seems to point toward the advent of such new conditions. Certain important rice-growing countries of the Orient, such as Java, the Philippines, and China, have for some time been relying in an appreciable measure upon foreign supplies, and appear to be growing ever more dependent. Japan has ceased to be a rice-exporting nation, and is importing substantial quantities of the article from abroad. The price of the commodity in Japan is said by the Imperial Institute to have risen by more than 90 per cent between 1900 and 1913, and an increase of 72 per cent is indicated by other data—altho doubtless some part of this price change, apparently based on figures for Japanese varieties, may be due to the preference of Japanese consumers for home-grown rices in the face of progressively inadequate supplies.[5] Moreover, it is reported that in Burma, the chief Indian producing district, the rice acreage "has practically reached its natural limit," while as to Cochin-China there is intimation that extension of cultivation waits on an increase of population and an extension of land improvement works.[6] Then, too, increasing oriental consumption of oriental rice is to be expected as these eastern countries are more extensively opened up, and on this account possibly, as Copeland intimates, "there is no evident reason to fear

5. Imperial Institute, Reports on Rice, p. 111; data on the average price of rice in the Yokohama Rice Exchange, compiled from the Summaries of the Yokohama Annual Statistics.

6. Imperial Institute, Reports on Rice, pp. 79, 116.

that rice produced in Europe and the Americas will encounter increasingly serious competition from oriental surpluses."[7] Finally, the evidence of the movement in world prices of rice relative to the course of such prices in the United States suggests a material change in the relative position of American values since 1913. The following table exhibits the movements in the price of this commodity over recent years in relation to prewar conditions, for the important markets of London, Calcutta, Tokyo, and New Orleans:[8]

AVERAGE ANNUAL PRICES OF RICE

(*Average Prices 1901–10 = 100*)

	1921	1922	1923	1924	1925	1926
England	259	208	208	235	224	228
India	228	214	204	227	210	227
Japan	220	247	230	273	299	272*
United States ...	105	142	133	141	168	176

* August, 1926, subsequent quotations being unavailable.

Obviously the advance of prices elsewhere than in the United States has been distinctly more considerable. At the latest available date, December, 1926, the price in England was 131 per cent above that of the base period, that in India 124 per cent, and that of Japan 172 per cent (August, 1926), whereas in this country the price has risen by only 54 per cent. To be sure, exchange upon India and Japan was then abnormal — the rates being about 25 per cent and 2 per cent, respectively, below parity; but allowance for this factor would not bring foreign prices to the low level of the American.[9] On the basis of the returns, it would seem

7. Copeland, op. cit., p. 333.

8. To the evidence of this tabulation, it may be added that while prices for other markets during 1926 remained steady or even increased, those in the American market fell persistently from 195 in January to 154 in December.

9. Data except those of domestic prices were secured from the Bulletin Mensuel of the Institute International de Statistique. The prices there are derived from the Statist, London, publications of Prices and

that values abroad had indeed changed to favor the American export trade.

There are contrary considerations, however, that seem of equal, if not greater significance. For example, the figures of world production show no diminution of supplies. Admittedly these statistics are bound to contain a large measure of estimate; but data on exportation from the chief surplus areas of India, French Indo-China, and Siam, — somewhat better figures, probably, — show no such tendency either. Instead, they reveal a rising volume of exports. Net exportations — India having both exports and imports of the commodity — averaged 8,332,000,000 pounds in 1904–08; 9,284,000,000, in 1909–13; and 9,492,000,000 in 1921–23.[1] Since these countries supplied over 90 per cent of the rice entering world commerce throughout this period, there seems little excuse for optimism with respect to the position of the American industry. Of course, we take no account here of the demand side — the growth of population, the possible increase of per-capita consumption in rice-importing nations, and the like; but unhappily we cannot, for lack of information. Possibly world consumption has enlarged beyond the proportion of increase in supplies exhibited in the above figures; but when one considers the enlarged production in this country and South America, the maintenance of the industry in Europe, and the generally decreased pur-

Wages in India, Calcutta, and the Oriental Economist, Tokyo. Domestic prices are taken from the reports of the Bureau of Labor Statistics. These American figures, unfortunately, are not homogeneous throughout. Through 1913 they refer to the variety called "Domestic, choice," and thereafter to "Honduras, head." A continuous series from 1901 to date was devised by arbitrarily assuming the relation of price for "Honduras, head" between 1913 and 1901–10 to have been the same as that which did obtain with regard to "Domestic, choice."

1. Yearbooks of the United States Department of Agriculture. I have purposely omitted the years 1919 and 1920, when exports sank exceptionally low, approximately 5,000,000,000 pounds per annum. These seem abnormal years.

chasing power abroad, there seems no adequate reason for believing so.

Most convincing against all arguments that would seek to show an improved position of the American export trade, however, is the concrete evidence that in reality this trade of late years has fallen off decisively as compared with 1918–21. Lower purchasing power in Europe, disordered exchanges, occasionally poor domestic crops, and so forth, seem inadequate explanations, individually or collectively, of the marked drop in our recent exports. War conditions were responsible for the sudden extension of our rice-growing industry and the appearance of the United States as a country of surplus rice production. Probably imports will exceed exports in normal years, and the latter will be confined geographically to areas farthest removed from oriental competition. Large exportation to the East is most unlikely.

In the application of wheat-growing technique to the cultivation of rice, the United States has made a real contribution to the science of agriculture — perhaps not so positive or far-reaching a contribution as the original development of that wheat-growing technique itself, but not less startling. The rapidity with which the change came in rice cultivation, and the very fact of its application to a crop that grows in standing water, give an aspect of the unusual and the spectacular to this particular advance. At present, other rice-growing areas lack the economic incentive to the adoption of this American technique, except Brazil, where a small rice cultivation with American methods has sprung up in recent decades. In the chief rice-producing regions, those of the Orient, the inter-relations of productive factors as yet makes the use of our machinery impos-

sible. Thus, Copeland finds that the employment of binders is justified, that is, advantageous, only if wages are more than two dollars a day; but "any such wage for farm labor is unheard of anywhere in the East." [2] In time, with the increased industrialization of the Orient, — an industrialization which may go beyond anything that even Japan has yet experienced, — opportunity may come for the introduction there of American machines and American methods; and so, in the end, possibly our discoveries will be of world-wide significance.

For the present and for the visible future, the maximum effect which these advances have had, and perhaps can have, is to assure control of the domestic market to domestic rice growers. Altho precise data on costs of production here and in the Orient are unobtainable, and therefore the argument must rest upon a rather insecure foundation, there seems reason to suppose that the domestic cultivation would be able to withstand much more vigorous competition than that to which it is exposed under the shelter of a substantial protective tariff.[3] No doubt, as Professor Wright found in the case of domestic sugar production, an agricultural industry tends to expand to the point determined by the duty-paid price of foreign competing goods: the margin of cultivation is fixed by normal price, and not vice versa.[4] Moreover, under the spur of war-blown opportunities and increased domestic consumption, no doubt the margin of the domestic rice-growing industry has been extended beyond the point which ordinary conditions will support. Yet unquestionably there are many areas in the United States, where labor-saving technique is combined with fertile soils, which would

2. Copeland, op. cit., p. 253.

3. The existing tariff of two cents a pound on milled rice makes an *ad valorem* rate of about 33⅓ per cent at present prices.

4. P. G. Wright, Sugar and the Tariff, *passim*.

continue operations little disturbed by a reduction, or even an abolition, of the present tariff duties. What part of the industry would be destroyed and what portion saved with the adoption of a new commercial policy toward rice, cannot be even guessed at with the existing paucity of data; but one may, I think, be confident that a large share of domestic needs would continue to be satisfied from domestic sources of supplies.

But even if such be the case with respect to the relation of domestic production to the domestic market, little hope can be entertained that for the present, American rice can successfully invade world markets. Despite particular conditions and productive factors which seem greatly to favor the domestic industry, such as large-scale operations, labor-saving devices, and an efficient milling industry, the conditions of relative wages and standards of living seemingly are too strong countervailing forces to be brushed aside. The domestic rice-growing and rice-milling industry does not possess the competitive strength adequate to support any considerable export trade. Certain combinations of factors may again bring the industry to a position of power such as it enjoyed in the war and early post-war years; but apparently a status of this sort could not last, unless, to be sure, further and continuing improvements should come in the domestic methods, or a real alteration in conditions should supervene in the East. Basically the domestic industry is in a bad tactical position. As long as the American rice grower, paying wages determined by general American effectiveness, is pitted against the Oriental who takes what the world market will give, the case seems hopeless.

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THE GOLD-EXCHANGE STANDARD

SUMMARY

Foreign exchange in relation to token coinage, 644. — Essence of gold-exchange standard, 645. — Its origin, 646. — The Lindsay Plan, 648. — Gold-exchange standard a failure in India, 650. — This standard in the Dutch East Indies, 651. — Operation of this standard in the Philippines, 654. — The Straits Settlements, 657. — The experience of Mexico, 658. — The validity of the principles, 660.

AFTER it had been developed that a metallic standard of gold possessed in general more advantages and less disadvantages in which to express the prices of goods on a large scale, than other standards, and after it was obvious that a large percentage of the world's population must have a medium of exchange for small transactions, especially those of low civilization, or those of high civilization for retail trade, the gold standard came to have new connotations. The schemes for a bimetallic system had been shown to be impracticable and unable to solve the difficulties arising from changes in the level of prices. International payments were admittedly to be made in gold. Yet silver, clearly proved by its violent fluctuations to be unsuited for a standard of prices, and relegated to a subsidiary position as a token coinage for exchanges of a value higher than those needing nickel and copper, could not be dispensed with; but its relation to the gold standard had to be fixed. In domestic transactions this was accomplished effectively by the laws of token coinage, by which redemption in gold automatically regulated the supply and also the value of the silver token coins in circulation. But in cases where silver had been the

traditional money, as in India or China, and yet trade was carried on with gold-using countries, how could silver and gold be used interchangeably? It was not a question of bimetallism; it was an application of the laws of token coinage to international usages. International gold payments had been economized by the use of foreign exchange, and the price in silver of exchange with foreign countries depended upon whether the domestic redemption of the token silver coins in gold was effective. Thus there appeared the problem of gold exchange in its relations with silver token coins. By some the solution of this question has been regarded as the discovery of a new sort of standard, known as the gold-exchange standard.[1]

The mechanism of the gold-exchange standard seems to pivot on the method of keeping the silver token coins at par with gold. It is repeatedly emphasized that it is a system in which gold is not in local circulation, that the expense of maintaining a gold circulation is avoided, and yet prices are expressed in gold; in other words, it is the creation of "a gold standard without a gold currency." In principle, there may be no gold reserve in the country.[2] It is assumed that the local token silver currency can be adjusted to a fixed ratio in gold by scarcity or abundance. When the face value of the silver coins is greater than the market value of their silver content, they are to be kept up to par by withdrawal, that is, by "rarefication" of the currency. The parity is to be maintained by adjusting the currency supply to the currency demand, and not by a system

1. Cf. especially E. W. Kemmerer, Currency Reforms (1916), and H. H. Hanna, C. A. Conant, and J. W. Jenks in House of Representatives, Document 144, 58th Cong., 2d. Sess. (1903), and in Report on the Introduction of the Gold Exchange Standard to the Secretary of State (1904).

2. Kemmerer, op. cit., pp. 320, 321. See also his index, "Gold-Exchange Standard."

of direct redemption in gold. Nevertheless, there must exist a gold reserve, if not at home, then in a foreign financial centre, on which gold exchange can be drawn. When a local merchant wishes to pay a foreigner, he offers to the bureau in charge of selling or buying exchange enough silver coins at the current rate to pay his debt in gold abroad. The bureau withdraws the silver paid in from circulation, and thereby the circulation is contracted. This is the process of keeping the value of the silver currency up to the desired point. If it goes too high, then the policy is reversed; foreigners wishing to pay for exports from the given country buy with gold in the foreign exchange market a bill payable in the token coins of the given country. When this is presented and cashed, silver is released and the circulation is duly expanded *pro tanto*. Thus silver token coins are to be kept at a fixed value in gold by the use of foreign gold exchange. Hence the name of a gold-exchange standard.[3]

The nature of the gold-exchange standard is made clearer by looking into its origins. It will thus appear that the principle employed in maintaining the value of any token coins is the same as the principle adopted in maintaining the value of any paper money in terms of gold. Hence we are dealing with a general, not with a particular, law when we are inquiring into the means

3. J. M. Keynes, in his Indian Currency and Finance (1913), p. 30, thus defines the gold-exchange standard: "The Gold-Exchange Standard may be said to exist when gold does not circulate in a country to an appreciable extent, when the local currency is not necessarily redeemable in gold, but when the Government or Central Bank makes arrangements for the provision of foreign remittances in gold at a fixed maximum rate in terms of the local currency, the reserves necessary to provide these remittances being kept to a considerable extent abroad." Later events make it incorrect to say, as he does, that this standard exists in Mexico and the East Indies, and virtually exists in Japan (which has the straight gold standard); nor has it become "the prevailing monetary system of China" (p. 36).

of keeping subsidiary and token coins at a fixed ratio to gold: the general law of immediate redemption, rather than the preparatory process of scarcity or abundance.

It at once appears that the gold-exchange standard is not at all new. Mr. A. M. Lindsay, the author of such a plan for India, himself notes [4] that it had been in operation in Scotland from 1763 for forty years, when the Scotch banks drew drafts at fixed rates on a conversion fund established in London. Moreover, Lindsay found the basis of the plan in Ricardo's proposals for the redemption of the Bank of England notes in gold bullion in 1819. The fluctuation of these inconvertible notes showed in the exchange drawn on foreign gold currencies. Hence Ricardo believed that it could be removed "by subjecting the Bank to the delivery of uncoined gold or silver at the Mint standard and price (£3 17*s.* 10½*d.* per ounce), in exchange for their notes, instead of the delivery of guineas; by which means paper would never fall below the value of bullion without being followed by a reduction of its quantity"; [5] and, *per contra*, to prevent a rise, to give paper for gold coins at £3 17*s.*, for example. Obviously, Ricardo saw that the quantity of circulation was regulated by redemption; under convertibility no more could stay out than was wanted by the needs of trade.

Dr. G. Vissering, also, recounts that the Dutch East Indies, before 1845, had been swamped by copper coins, and that silver coins had practically disappeared. Altho there was no silver in circulation, the Government thereupon agreed to draw silver bills on Holland, to enable imports to be paid for.[6] New paper money (or *recepissen*) was issued, which was receivable by the Govern-

4. Fowler Commission, Evidence (1899), Q. 3360.

5. Ricardo, Works (McCulloch's ed.), p. 403.

6. G. Vissering, The Netherlands Bank and the War: Part 2, The Netherlands East-Indies and the Gold-Exchange Standard (1916), p. 64. The Hague, Nijhoff.

ment on the same basis as silver, and the notes of the Bank of Java were made redeemable in it. But these notes could be used to purchase bills at 95 on Holland which were there redeemable in Dutch silver guilders. Thus, altho redemption was on a silver standard, the principle was the same through exchange drawn on silver in Holland as in any other case of exchange drawn on a gold standard.[7]

In India, in connection with the desire to maintain the silver rupee at a fixed relation to British gold currency, and to prevent fluctuations in the price of sterling exchange for settling international transactions, the so-called Lindsay plan,[8] or the gold-exchange standard, was prominently mentioned among the various methods of accomplishing the purpose. It proposed a gold fund of £10,000,000, part kept in London, and part in rupees in India, on which, in order to keep the rupee at 16*d.*, the Government would sell without limit demand drafts on London at 15¾*d.* (the supposed gold export point in India), and in London would sell without limit demand

7. On the assumption that the test of a gold-exchange standard is the existence of a foreign reserve fund on which bills can be drawn, J. M. Keynes holds that Russia gave the first example of it: "The method of keeping a token currency at a fixed par with gold by means of credit abroad was first adopted by Count Witte for Russia in the transitional period from inconvertible paper to a gold standard; — in the autumn of 1892 the Department of Finance offered to buy exchange on Berlin at 2.18 marks and to sell at 2.20." Indian Currency and Finance, p. 32.

8. Kemmerer (op. cit., p. 80) thus summarizes Lindsay's efforts: "It appears to have been first proposed for India by Mr. Lindsay in 1876. It was discussed by him in the Calcutta Review for October, 1878, and July, 1885; also in the Bankers' Magazine (London) of August and September, 1892. In the latter month Mr. Lindsay published a pamphlet on the subject, entitled Ricardo's Exchange Remedy, a Proposal to Regulate the Indian Currency by making it Expand and Contract Automatically at Fixed Sterling Rates, with the Aid of the Silver Clause of the Bank Act (36 pages; Effingham Wilson). The plan was mentioned as one of various schemes in the Herschell Committee's Report (1892), sec. 144.

drafts on India at 16⅛*d.* The importer of goods in India thus bought with his rupees, not gold, but exchange drawn on gold in London with which he could pay his debt there. In short, Lindsay substituted gold exchange for Ricardo's uncoined gold bars. In theory, it was expected that the silver rupees received in India in payment of the gold exchange would be withdrawn from circulation, thereby contracting it, and tending to raise the value of the rupee. There was to be no internal gold circulation tempting to hoarding; international payments would be made with a stable exchange, and India would retain the rupee currency with which it was familiar.

In this plan, of course, there was no direct redemption of domestic rupees or token coins in gold. Reliance was had on producing a scarcity of rupees which was supposed to be sufficient to raise their value. This could not be effected solely under the Lindsay plan; but it was directly accomplished in 1893 by the closing of the mints to the free coinage of silver, because hoarding of silver could be counted on soon to reduce the rupee circulation. Thus, under the Lindsay form of the gold-exchange standard, scarcity, not redemption producing scarcity, was relied on to keep up the value of the token coin. The adjustment of the token money to the demand for it in trade (not for hoarding), as we know on general principles, can be automatically created by redemption in gold; then the supply takes care of itself (assuming, of course, that token coins can be freely obtained by offer of gold). Scarcity is not a cause, in my judgment, but an effect, in a properly adjusted system of direct redemption. Moreover, the offering of foreign gold exchange in return for rupees advantaged mainly those who had need of foreign bills, and not those who were occupied solely in domestic

trade. Hence it was not a comprehensive method of redemption. Therefore it is partly explicable why the Lindsay plan was not adopted.

Altho the Lindsay plan was not adopted, India drifted into a form of the so-called gold-exchange standard after 1898, when the rupee came to be maintained at 16*d.* as a token coin. Without legislation, some kind of a gold standard persisted, except during 1907–08, by the mechanism of indirect redemption through gold exchange. Bills on London were not sold without limit, and hence there was often much uncertainty in the mind of the public as to the stability of the standard. The vacillation in the India Office might be said to have prevented a fair trial of this system. Nevertheless, there were shortcomings in the system itself. The unwillingness to face the situation and the lack of courage to secure direct redemption caused the "muddling through" until the World War. Then the Chamberlain Commission feebly accepted the gold-exchange standard, and India stumbled along with it during the World War, and through the upheaval caused by the amazing rise in the value of silver from 1915 to 1921. Finally, the Young Commission of 1926 flatly announced that the gold-exchange standard had been a failure. It mentioned the danger from the disappearance of the rupee, if silver again rose violently in value; but that happening, we know, would be uncertain. Apart from that point, it condemned the system on other grounds:

> The chief defect is that, altho it secures stability, it has not the simplicity which is essential to secure the confidence of public opinion for any currency system under present conditions in India. The mechanism of an exchange-standard is refined. Some knowledge of economics is necessary to understand it. The right of convertibility upon which its stability is based is one of no direct concern to the general public, and it is unintelligible to the majority. The uninstructed see nothing tangible behind the token currency to assure its value. These characteristics, inherent in an exchange standard,

make it unsuitable to the needs of a vast community or collection of communities, the various members of which are of all degrees of education, and indeed of all stages of civilization. It is impossible also to ignore that for historical reasons, into which it is unnecessary to enter, there is a large body of public opinion in India that is suspicious of the mechanism of an exchange standard. It is convinced that this mechanism can be manipulated and it fears that it may be manipulated in a manner inconsistent with Indian interests.[9]

The argument that the monetary system is not intelligible to the majority is scarcely a legitimate point against the gold-exchange standard, since even here in the United States there are many persons who do not understand our own monetary system. With us, also, there exists a suspicion among many classes that the moneyed interests and "Wall Street" can manipulate our system to the detriment of other classes. In fact, monetary problems are obviously matters for the experts. The real difficulties which arose in India should undoubtedly be ascribed to the shortcomings in the principles on which the so-called gold exchange was based. On these, rather than on the points mentioned by the Young Report, should the admitted failure of the gold-exchange standard be blamed. Moreover, it was not to be expected that a gold-exchange standard would prevent a token coinage from upheaval, when an unexpected and amazing rise in the value of silver made the silver content worth more than the face value of the token coins. Under a straight gold standard, there would, of course, be no serious difficulty, if token money were replaced by gold equivalents.

In the Dutch East Indies it seems clear that the so-called gold-exchange standard was only one step on the way from the original single silver standard to the final single gold standard. Since the revision of the Con-

9. Young Report, 1926, vol. i, par. 30.

stitution in 1848, and the following Act of May 1, 1854, the coinage has been the same for the mother country and the colonies. As the mother country adopted the single silver standard in 1847, so the colonies had silver pieces of 2½, 1, and ½ florins, with subsidiary coins of silver and copper of limited legal-tender power. Foreign debts of the colonies were paid in their silver coins.

When silver began in 1873 its long decline, Holland, after a five years' struggle, was led to adopt the gold standard, taking away the free coinage of silver by the Act of June 6, 1875. Silver coins became token coins at a fixed relation to gold. Nominally the colonies — no change being observable — continued the use of silver money, and did not use gold. Altho not legally necessary, the gold 10-florin piece was made legal tender in the colonies, by the Act of March 28, 1877, and removed any opposition to gold. Yet the silver token coins had unlimited legal-tender power. Obviously these silver token coins could not be used in general foreign payments; but, if sent to Holland, they were receivable there at the fixed rate in gold, and thro Holland gold could be had for payment to other countries. That is, not having gold in circulation, the colonies using a token silver money could obtain gold exchange on Holland in return for token silver. In this form there existed through common usage and without theorizing about general principles what was called a gold-exchange standard. But, by having abolished free coinage of silver, the Dutch East Indies and Holland escaped the losses of other countries from having large stocks of a metal which fell in value after 1873.

In this form of the gold-exchange standard it is to be observed that no emphasis is placed on the argument that, when the domestic token coins are paid in for gold exchange, it is the scarcity thereby produced which

raises the value of the domestic currency. In fact, it is theoretically not a true example of the modern gold-exchange standard. The quantity of the silver coin needed is supplied from Holland.

As a matter of fact, the system is probably listed under the gold-exchange standard only because there was no gold used in the local circulation. But left to itself, so far as this test is concerned, gold later came into large use in the colonies, and it should thereby have ceased to be a gold-exchange standard. In the time before 1875, the date of the cessation of free coinage, a surplus of silver had accumulated in Holland and threatened the gold standard, so that the Act of 1884 was passed to enable her to sell silver coin for gold. Fortunately, the expansion of trade, the growth of plantations, and the increase of production in the colonies caused an increase of their exports. Thus there was an increased demand for silver in the colonial circulation, and, as exports developed, larger amounts of bills were drawn on gold-using countries. When silver had been reduced to a low level in Holland, and when it was needed for token coins at home, and as gold had been heaping up in the Netherlands Bank before the World War, it became the policy to remit gold, instead of silver, to the colonies. Thus enough gold was accumulated in the reserves of the Dutch East Indies to protect the token coinage there. This outcome led Dr. Vissering to conclude that the so-called gold-exchange standard was not a special kind of standard, but only a name for a temporary stage in the transition from a silver régime to a pure gold standard.[1]

1. See On Chinese Currency (1912), pp. 10 and 12: "It started as a new name for things, already actually found in practice. Sometimes, therefore, a gold-exchange system is only a variety, with a gradual difference in application, of a currency system which is really based upon a gold standard, or rather upon a limping standard."

The case of a gold-exchange standard which has been most advertised is that established by the United States in the Philippines. The Act of 1903 established a gold unit at 50 cents (containing 12.9 grains standard, .900 fine), and for general local use a silver peso of 374.4 fine (or 416 grains standard, .900 fine). The gold coins and the silver peso were both made unlimited legal tender (the new subsidiary coins only to 10 pesos). In 1903 the silver bullion in the peso was worth 37.7 cents, thus making a seigniorage of 32.4 per cent. To keep the overvalued silver peso at par with gold, a Gold Standard Fund was provided from the sale of $10,000,000 temporary certificates, from which silver pesos were redeemed on presentation at the rate of two pesos for one dollar. Obviously, this system treated the silver peso as an ordinary token coin redeemable in gold. This does not constitute anything new. The name of a gold-exchange standard seems to hang on the method of getting foreign exchange by presenting silver pesos. Nevertheless, if the pesos are exchangeable for gold at the Philippine Treasury, dealers in exchange on gold-using countries would not hesitate to sell for pesos. According to the advocates of this so-called new standard, the characteristic features are the absence of gold in domestic circulation; the use of drafts on a gold reserve abroad; the sale of these bills for local token silver; the withdrawal of the silver from circulation; the consequent reduction in the quantity of the local currency, thus effecting an increase in its value and a corresponding fall in the price level. *Per contra*, a sale of gold bills in New York on Manila drawn on silver funds there would release the silver for circulation, increase it, and lower its value, thus raising prices. It is claimed that in this way the token money is kept at par with gold.

The function of gold exchange seems to exist through

drawing in and out of the local circulation enough silver coins to control their value, acording to the quantity-theory of money. To my mind this is fallacious reasoning because it fails to admit that the par is maintained directly and only by the redemption in gold, and not by the change in the quantity of token silver in circulation. In fact, the quantity is determined by the redemption, since only that which is not needed would be presented for redemption. If more is wanted, it can be had only by offering gold. Moreover, if the token silver is kept at par in gold by immediate redemption, then gold exchange will take care of itself, since exchange will then be bought and sold with funds at par in gold. The pivotal point is the maintenance of the gold reserve by which redemption is assured. Everything hinges on this condition, not on the quantity of the domestic token money. It is anomalous to bring in a theoretical concept, which has no relation to actual life, as an explanation of something already accounted for.

It is assumed that the rate of exchange on gold-using countries is determined by the redundancy or scarcity of the currency, and that the sale of drafts provides the means "of automatically adjusting the currency supply to the demands of trade without the necessity of introducing gold coins into circulation; in other words, to create 'a gold standard without a gold currency.'" [2] In actual practice, however, there are two elements affecting the rates of exchange in international trade: (1) the value of the standard in which the exchange is drawn (for example, whether a fluctuating paper or silver standard, or a fixed gold standard); and (2) the variations in visible and invisible exports and imports which cause changes in the rate of exchange within shipping points. The old classical theorem that exports

2. Kemmerer, op. cit., pp. 320, 373.

of money from country A to country B raise the level of prices in B, and cause a readjustment of exports from B to A,[3] is obsolete and no longer to be accepted. For instance, the great import of gold into the United States during and since the World War, because of the exports of war material to Europe, was not in itself the cause of any rise of prices in this country, since prices actually declined at times when gold was coming in; but war prices were directly affected by increasing war costs. Hence, in a country, like the Philippines, with a token silver local currency, if the silver is redeemed in gold funds, the exchange will be computed on a gold basis, irrespective of any statistics as to the quantity of silver in local circulation. Any fluctuations in exchange will then depend on changes in exports and imports of goods or invisible financial operations.

The insufficiency of the gold-exchange standard explanation appeared when, later in its operation, the insular authorities (by Act No. 2083, December 18, 1911) allowed a part of the Gold Standard Fund to be invested in long-term, non-liquid loans to municipalities or railways or mills, so that the cash in it could be reduced to 17½ per cent. This undesirable policy was criticized by Professor Kemmerer on the ground that such withdrawals from the Gold Standard Fund interfered with its function of regulating the supply of the silver currency to the demands of local trade.[4] To my mind the policy is wrong because it depletes the reserve for the

3. "It is a familiar principle that, when the balance of trade becomes strongly 'unfavorable' in gold standard countries, i.e., when the currency becomes relatively redundant, exchange rates move to the gold-export point and gold is exported, and, on the other hand, when the balance of trade becomes strongly 'favorable,' i.e., when the currency becomes relatively scarce, exchange rates move to the gold-import point and gold is imported." (Kemmerer, Ibid.) In truth, changes in the foreign demand and in the costs of production of the goods exported directly affect prices and thus influence rates of exchange.

4. Op. cit., pp. 374–382.

redemption of the token silver. So long as that remains sufficient for this purpose, the pesos will be kept at par with gold at the fixed rate, and redemption will automatically maintain their quantity at the sum needed by local trade. More pesos can be had at any time by the offer of gold funds, and any redundancy can be disposed of by presenting them for redemption. The function of foreign bills drawn on gold funds abroad belonging to the Treasury simply offsets payments for imports, so that they can be balanced against exports and thus allow the shipment only of gold or credit to cover an unbalanced international account. The gold standard is maintained in the islands by redemption of the token silver, and not by any so-called gold-exchange standard.

In the case of the Straits Settlements there was needed for the large number of small domestic transactions a small unit of money, which was provided by a silver token currency of Straits dollars and fractional silver. For larger transactions, especially in international trade, gold was employed. As an English colony dealing with London, the token silver dollar was fixed in exchange for sterling at 28*d*. To keep the silver dollars (and the notes payable in silver) at this rate with gold, an importer could pay his debt to London by giving the authorities in Singapore enough silver dollars or notes to cover the fixed rate (28*d*.) for gold, *plus* the charges for remitting gold to Singapore, which included freight, insurance, packing, shipping expenses, and interest. This was a system of redemption of token money in gold funds, so that the dollar could not fall below 28*d*. *Per contra*, silver dollars, if scarce, could be obtained by offering sterling bills on London. Between the limits of about 28$\frac{1}{2}$*d*. and 27$\frac{11}{16}$*d*., gold would

move either from London to Singapore or from Singapore to London. That is, silver could be turned into gold, or gold into silver, at a fixed rate, with no more delay than the time of telegraphing. This constituted a system of immediate redemption of the token silver in gold. The amount of the local circulation was thus automatically provided by presenting silver for gold sterling when redundant or by buying silver (when scarce) with gold funds.

Yet the Straits system is regarded as an example of a gold-exchange standard.[5] The only characteristics, however, seem to be the absence of a local gold circulation; the holding of a Gold Fund in London on which bills could be drawn; and the possibility that, when token silver or notes were offered for sterling, the silver would be withdrawn from local circulation, thus contracting its quantity. None of these are of importance as contrasted with the system of actual redemption, as above described, in gold. Nothing else seems to explain the maintenance of the value of the token silver at the fixed rate. There is no evidence that this was accomplished by causing a scarcity or abundance of the local currency according to the quantity-theory.

The experience of Mexico throws little or no light on the question of a gold-exchange standard. The great fall in the value of silver by 1903 led to a general desire to escape from the evils of a fluctuating silver standard. The attempt was made to fix some definite relation between gold and silver, and save silver from further depreciation. China was induced to join with Mexico in asking Europe and the United States to find remedies for unstable exchange between gold- and silver-using coun-

5. Kemmerer, op. cit., pp. 421, 422, 456.

tries. The movement to bring Mexico to the gold standard held out the hope that through the gold-exchange standard it would be easier to pass from a silver standard to that of gold, since no local circulation of gold would be required; and also that the local silver currency could be maintained at a fixed rate by regulating its quantity without the expense of a gold reserve fund for purposes of redemption. The Mexican Monetary Commission, in its interesting reports on the problem, shows the influence of those on the American Commission — appointed to aid Mexico — who favored the gold-exchange standard and who based their support on the reasoning of the quantity-theory. The majority of the Mexican Commission favored a plan to raise the value of the silver peso from about 43¼ to 50 cents in United States money by limiting its quantity, but not to assume any responsibility for redeeming the peso in gold. Moreover, in the decree of March 25, 1905, free coinage of silver was to be discontinued, contraction of the currency to be caused (there already being a duty on the import of Mexican pesos), until the peso rose in value to par with gold (75 centigrams of gold, or 49.85 cents United States money). Then there was created a Comision de Cambios y Moneda, to control foreign exchange through the Fondo Regulador de la Circulacion Monetaria, or gold reserve, so as to regulate the quantity of the circulation in order to obtain stable exchange. Here we have the familiar mechanism of the Philippines, by which the quantity of the circulation could be regulated by buying foreign exchange with local silver and having it withdrawn from the circulation, thus increasing its value, and affecting the price of exchange. The fundamental principle was the quantity-theory, by which the value of the silver could be regulated by its quantity, without the necessity of redemption in gold. This was

the theory which the Young Indian Commission of 1926 rejected.

Unexpectedly, however, this plan was never put to the test because of the amazing rise in the value of silver bullion. On October 21, 1905, the pure silver content of the peso was worth more than the 75 centigrams of gold, or bullion par; and it rose very much higher later on. The Government took advantage of this happy event and sold its silver circulation for gold at a profit of about 8,000,000 pesos, and thereby passed at once without effort to the single gold standard. This disposed entirely of the proposed gold-exchange standard. Only its reasoning remains as a matter of history.

The gold-exchange standard is a graft on a token coinage system to produce a quasi-gold-standard. The usual principles of a token coinage system are well known. They are: (1) a face value of the coin greater than the market value of the pure content, creating a seigniorage; (2) absence of free coinage; (3) a limited quantity in circulation; (4) usually, with a limited legal-tender power but sometimes, for historical reasons, with an unlimited legal-tender power; (5) a strict convertibility into the gold standard (except where other standards are taken as a comparison). For instance, a silver or copper token money is kept at par with gold only by some system of redemption in gold at a given rate. The seigniorage ought not to be so great as to induce counterfeiting, nor so slight as to cause melting. If redemption is efficient, a coin of quite low market value can be maintained at par.

At one time silver coins like the dollar and five-franc piece had, as a survival from a bimetallic régime, an unlimited legal-tender quality with gold coins; but, when

silver depreciated, it was inconvenient to drop these coins from use because of long-established habits. They fell into the class of token coins. When they retained their former historical unlimited legal-tender power, tied to gold by some system of indirect redemption, they caused what was rather clumsily called the "limping gold standard." Thus we have had in the course of monetary development a single silver standard, a "limping gold standard," a so-called gold-exchange-standard, and a single gold standard. The two intermediate varieties seem to have been stepping-stones from a single silver standard to a single gold standard. The bimetallic standard was an attempt to keep both silver and gold with full legal tender in concurrent circulation at a fixed rate, and has been generally abandoned as impracticable.

When a single-silver-standard country traded with a gold-using country, the fluctuations in the value of silver caused great difficulties in the foreign exchanges between these countries. Then, in the evolution of standards, when the old silver unit became a token money, the problem of foreign exchange still remained. Any uncertainty in the redemption of the token silver created difficulties in attempts to keep a stable rate of exchange. In this way the foreign exchanges entered into the problem of rating gold to silver token money. In reality, the resort to foreign exchange adds no new principle in the standard question not already working in the case of a single-silver-standard country. Since, if the silver token money (not all the silver in the world) is kept strictly convertible into gold, the foreign exchange is kept stable so far as any influence on it comes from the value of the standard (as independent of any play between exports and imports, visible and invisible). In short, the fixity of the relation between gold and the

domestic silver token money depends on the efficiency of the system of redemption, and stability of exchange follows as a matter of course. Moreover, the redemption of the token money itself determines the quantity in circulation, since the public presents it only if redundant (and assuming that it can be had by presenting gold when it is scarce). Consequently, should the system of redemption weaken, then the quantity of coin in use will no longer be regulated automatically, and its price in foreign bills drawn on gold will correspondingly fluctuate.

The error in the gold-exchange-standard reasoning exists to my mind in supposing that the value of the token coin is determined by the quantity in circulation, as demanded by the obsolete quantity-theory. This exactly reverses the logical order of cause and effect. It is a mistake to think that, when the token money is reduced or expanded by the purchase or sale of foreign exchange, the value of the token money is changed (certainly if redemption is efficient). The rates of foreign exchange are not to be fixed by the quantity of the circulation. Stable exchange is not to be arrived at by that path. In general, it will be found that the explanation of a fluctuation in exchange bought by token money is found in some inadequacy in the methods of redemption. That was certainly the case in India. In brief, the repeated failure of the gold-exchange standard, as exhibited in the cases summarized above, is owing to the invalid quantity-theory on which they have been based. There is no sufficient evidence to conclude that a change of prices of goods or exchange has been caused by a change in the quantity of the token money in circulation. Such a conclusion can be reached only by pure theorizing disassociated from actual fact.

One of the prime characteristics of a gold-exchange

standard is supposed by its supporters to be the absence of a gold circulation at home and the existence of a foreign gold reserve on which bills could be drawn. Of course, the selling of gold drafts for token silver (as in the "reverse bills" in India) is a method of redemption, and the place where the gold reserve is kept is not important for that purpose; in general, it must be kept where the trade between the given countries centers. But it is sometimes overlooked that trade in which the transactions are of considerable size is not confined to foreign trade. To be sure, gold is required in foreign payments. But, as trade increases in countries formerly served by silver, where transactions had been small, it will turn out that a money suited for large transactions will also be needed at home. Hence, redemption of token money for those engaged only in foreign trade is insufficient for all purposes. Therefore, reserves must be established at home to meet all demands. When this development comes about (as it has already in India) one prime characteristic of a gold-exchange standard disappears. Gold as well as token money is in use. Thus the intermediate service of the so-called gold-exchange standard ceases to function. And this apparently justifies the conclusion of Dr. G. Vissering that the gold-exchange standard is not a special kind of standard, but only a name for a temporary stage in the transition from a silver to a pure gold standard.

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GERMANY'S FOREIGN TRADE TERMS IN 1899–1913 [1]

SUMMARY

A new method proposed for measuring the trend of the terms of trade, 665. — Germany's pre-war trade balance, 666. — Distribution of imports and exports in main groups, 668; in detail, 669. — Trade balance in physical terms, 671. — Indices of changes, in value and in physical terms, 674. — Explanation of the changes, 674. — Increasing exports of capital after 1908, 680. — Significance of the rates of foreign exchange, 682. — Conclusion, 683.

SINCE Professor Bowley's most suggestive memorandum in the *Economic Journal* of December, 1903,[2] in which he analyzed the changes in respective quantities of imports and exports of the United Kingdom and Germany, increasing attention has been given by economists to the terms of real interchange in foreign trade.[3] The method proposed by Professor Bowley consists in computing the ratios of the price-indices of exports to those of imports;[4] it therefore necessarily neglects all possible changes in the non-merchandise items and their influence on the barter terms themselves. In order to correct this omission and to make the analysis in physical

1. In the preparation of this paper, I have had the advantage of Professor Taussig's guidance and criticism.

2. Pp. 628 ff.

3. Cf. articles by J. M. Keynes, Sir William Beveridge and D. H. Robertson in Economic Journal, Dec., 1912, p. 630; June, 1924, p. 286; Dec., 1925, p. 476; and in Economica, Feb., 1924. See also D. H. Robertson's Banking Policy and the Price Level (London, 1926), pp. 14–16, where the connection between the alterations in the ratios of inter-commodity exchange and the time and magnitude of the business cycle are discussed.

4. Prof. Bowley described the method in the Economic Journal of Dec. 1897, pp. 274 ff.

terms more complete and significant, Professor Taussig has proposed to draw a distinction between the "net" and the "gross" barter terms of trade, the latter representing the changes in the volume of exports that actually went out, in relation to the volume of imports that actually came in. The reader will be supposed to be familiar with Professor Taussig's method.[5] It suffices here to say that the indices of changes in the gross barter terms are computed under it in much the same way as the net barter terms themselves. Import and export values of the successive years are reduced to identical terms, when the larger or smaller value figures represent larger or smaller quantities. The characteristic of this whole method of approach is that physical barter terms are deduced from price changes.

It is here submitted that, subject to certain precautions, a more direct method may be employed. Since the aim is to determine the changes in physical quantities and not in values, it would seem desirable to turn to the physical quantities themselves, instead of arriving at them through prices. The results obtained by the two methods could than be used as a mutual check; and even tho the necessary import and export price statistics are lacking, the direct approach may bring in itself a significant measurement of the general trends. To see how it works out in practice, I propose to analyze in physical terms Germany's pre-war balance of foreign trade.

It will be well to consider first the German balance of trade as it stood in money values (Table I).

Two things stand out: (1) Germany had an "adverse" balance of trade; (2) it was tending to become each year distinctly less unfavorable. As appears from the

5. Economic Journal, March, 1925, pp. 1 ff. See also his recently published volume on International Trade, chaps. 11, 21, 24.

relatives, the exports were growing at a considerably more rapid rate than the imports, especially after 1907.

These figures, of course, do not admit of any definite conclusion as to the changes in Germany's barter terms

TABLE I. — TRADE BALANCE OF GERMANY, 1899–1913

(In millions of Marks)

Year	Money Values		Relatives	
	Imports	Exports	Imports	Exports
1899	5,483	4,207	100	100
1900	5,766	4,611	105	110
1901	5,421	4,431	99	105
1902	5,631	4,678	103	111
1903	6,003	5,015	110	119
1904	6,354	5,223	116	124
1905	7,129	5,732	130	136
1906	8,022	6,359	146	151
1907	8,744	6,845	160	163
1908	7,664	6,399	140	152
1909	8,520	6,592	155	157
1910	8,934	7,475	163	178
1911	9,706	8,106	177	193
1912	10,692	8,957	195	212
1913	10,770	10,097	197	240

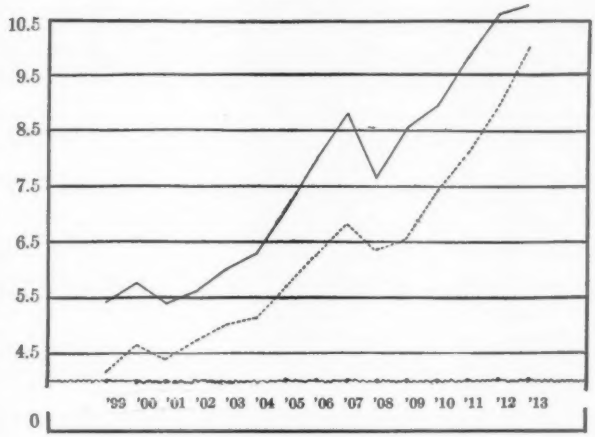
Compiled from Statistik des Deutschen Reichs (Neue Folge).

of trade. In order to get at German foreign trade figures in "real" terms, we should have to eliminate fluctuations due to changes in the value of money; and for this purpose, export and import price indices are required. No indices of this kind exist, or price figures from which they could be readily computed. I shall turn therefore to physical quantities themselves. The German trade statistics fortunately supply a wealth of material in this respect. They are given in metric tons, as well as in thousands of gold marks. They state, for large classes of goods and for a great range of

individual articles, the exports and imports by weight.

Here, however, a difficulty presents itself. Even if we should find that Germany had to send abroad an increasing total weight of her own goods in payment for a given weight of imported goods, this could well have happened as a result of changes in the make-up

CHART I.



Germany's Balance of Trade, 1899–1913.
(In Billions of Marks)
Data in Table I.

——— Values --------- Quantities

of either exports or imports. Such changes might result from an increase or fall in price of a particular commodity or of a particular group, bringing about a redistribution of demand and consumption, and so a preponderance of lighter or heavier classes of goods. A rapid growth in the quantity (by weight) of total exports as compared with total imports might have been caused, for instance, by a disproportionate increase of coal in

the make-up of the exports, or by a rapid decline of iron ore among the imports. The physical data must therefore be carefully scanned before any attempt can be made at an analysis of the significance of the total figures.

Such an examination I have made. For the earlier part of the period I have contented myself with the evidence presented in Table II. It shows that, when the imports and exports are distributed in three very broad groups, — raw materials, manufactures, foodstuffs, — no changes of moment takes place in the distribution.

TABLE II. — DISTRIBUTION OF GERMAN IMPORTS AND EXPORTS, 1899–1913, IN THREE MAIN GROUPS

(Percentages of Total Quantities)

	Imports			Exports		
	Raw Materials	Manufactures	Foodstuffs & Livestock	Raw Materials	Manufactures	Foodstuffs & Livestock
1899	77.6	4.8	17.6	83.2	8.6	8.2
1900	79.0	4.8	16.2	83.4	8.5	8.1
1901	76.8	4.8	18.4	83.3	8.6	8.1
1902	75.9	4.8	19.3	83.5	8.9	7.6
1903	76.9	4.6	18.5	83.4	8.9	7.7
1904	78.6	4.6	16.8	84.1	8.7	7.2
1905	77.8	4.3	17.9	84.5	9.1	6.4

Compiled from Statistik des Deutschen Reichs (Neue Folge), Band 173.

The later years, in which the rapid relative increase of exports is especially striking, have been subjected to a much more thoro test. Tables III and IV bring out the changes in the distribution of imports and exports according to the twenty commodity groups of the German customs schedule. Further, in tables V and VI, I have compiled figures pertaining to thirty commodities, constituting approximately 70 per cent of both exports

TABLE III. — DISTRIBUTION OF GERMAN IMPORTS, 1907–1913, IN TWENTY COMMODITY GROUPS

TABLE III. — DISTRIBUTION OF GERMAN IMPORTS, 1907–1913, IN TWENTY COMMODITY GROUPS

Customs Schedule Number	Commodity Group	Actual Quantities					Percentages of Total Quantities (to the nearest 0.1 %)				
		1907	1909	1910	1911	1913	1907	1909	1910	1911	1913
1	Agricultural products; foodstuffs	233,140	231,890	236,095	265,162	266,115	35.4	36.8	36.6	38.8	36.6
2	Mineral raw products; mineral oils	387,543	362,017	368,501	376,162	415,910	58.7	57.5	57.2	54.9	57.1
3	Products of the oil and fat industry, wax, soaps, candles, oils, etc.	396	381	425	439	457	0.1	0.1	0.1	0.1	0.1
4	Chemical and medicinal products, colors, etc.	13,588	16,093	17,767	18,355	20,593	2.1	2.6	2.8	2.7	2.8
5	Textile materials, ornamental feathers, fans, hats, etc.	2,584	2,505	2,562	2,695	2,990	0.4	0.4	0.4	0.4	0.4
6	Leather and leather wares, skins, hides, pelts, etc.	148	148	170	177	209	0.0	0.0	0.0	0.0	0.0
7	Rubber wares	20	27	38	40	41	0.0	0.0	0.0	0.0	0.0
8	Plaited wares	47	50	55	48	44	0.0	0.0	0.0	0.0	0.0
9	Brooms, paint and other brushes, sieves, etc.	19	16	16	16	14	0.0	0.0	0.0	0.0	0.0
10	Carved articles, etc.	437	411	430	498	471	0.1	0.1	0.1	0.1	0.1
11	Paper and paper wares	1,050	932	941	1,213	1,127	0.2	0.1	0.1	0.2	0.2
12	Books, pictures, paintings	63	65	71	73	75	0.0	0.0	0.0	0.0	0.0
13	Articles from stone and other mineral and fossil products	6,717	4,864	5,851	6,207	6,682	1.0	0.8	0.9	0.9	0.9
14	Earthenware	2,309	1,710	1,802	1,789	1,626	0.3	0.3	0.3	0.3	0.2
15	Glass and glass wares	154	203	260	253	166	0.0	0.0	0.0	0.0	0.0
16	Precious metals and articles therefrom [1]	12	00	00	00	16	0.0	0.0	0.0	0.0	0.0
17	Metals other than precious and metal wares	10,826	7,821	9,155	9,974	10,530	1.6	1.2	1.4	1.5	1.5
18	Machines, electrotechnical apparatus, etc.	959	733	743	831	1,030	0.1	0.1	0.1	0.1	0.1
19	Fire arms, watches, toys, etc.	17	13	15	15	17	0.0	0.0	0.0	0.0	0.0
20	Miscellaneous	50	45	37	39	45	0.0	0.0	0.0	0.0	0.0
	Total	660,087	629,935	644,944	683,995	728,168	100.0	100.0	100.0	100.0	100.0

Compiled from Statistik des Deutschen Reichs (Neue Folge), Band 251, and, for the years 1907 and 1913 from the Monatliche Nachweisen über den auswärtigen Handel Deutschlands.

Unit: 100 tons (233,140 = 23,314,000,000 Kgs.)

[1] Specie is included in 1907 and in 1913.

TABLE IV. — DISTRIBUTION OF GERMAN EXPORTS, 1907–1913, TWENTY COMMODITY GROUPS

Customs Schedule Number	Commodity Group	Actual Quantities					Percentages of Total Quantities (To the nearest 0.1%)				
		1907	1909	1910	1911	1913	1907	1909	1910	1911	1913
1	Agricultural products; footstuffs	37,113	44,724	51,476	51,177	66,559	8.3	9.2	9.5	8.7	9.0
2	Mineral raw products; mineral oils	325,906	346,379	375,815	415,063	518,563	72.5	71.1	69.4	70.3	70.4
3	Products of oil and fat industry, wax, soaps, candles, oils, etc.	316	331	371	403	483	0.1	0.1	0.1	0.1	0.1
4	Chemical and medicinal products, colors, etc.	28,017	31,286	37,231	40,293	49,038	6.2	6.4	6.9	6.8	6.6
5	Textile materials, ornamental feathers, fans, hats, etc.	3,304	3,232	3,680	3,772	4,264	0.7	0.7	0.7	0.6	0.6
6	Leather and leather wares, skins, hides, pelts, etc.	336	407	471	503	545	0.1	0.1	0.1	0.1	0.1
7	Rubber wares	77	79	92	104	197	0.0	0.0	0.0	0.0	0.0
8	Plaited wares	40	40	46	46	45	0.0	0.0	0.0	0.0	0.0
9	Brooms, paint and other brushes, sieves, etc.	26	25	28	30	30	0.0	0.0	0.0	0.0	0.0
10	Carved articles, etc.	751	772	909	979	1,119	0.2	0.2	0.2	0.2	0.2
11	Paper and paper wares	3,387	4,127	4,715	4,826	5,431	0.7	0.8	0.9	0.8	0.7
12	Books, pictures, paintings	241	239	246	244	243	0.0	0.0	0.0	0.0	0.0
13	Articles from stone and other mineral and fossil products	1,280	1,654	1,690	1,736	2,881	0.3	0.3	0.3	0.3	0.4
14	Earthenware	4,985	4,639	5,312	6,103	7,785	1.1	1.0	1.0	1.0	1.1
15	Glass and glass wares	1,773	1,498	1,811	1,935	2,458	0.4	0.3	0.3	0.3	0.3
16	Precious metals and articles therefrom[1]	6	2	2	2	10	0.0	0.0	0.0	0.0	0.0
17	Metals other than precious and metal wares	36,666	42,814	51,406	56,725	68,464	8.2	8.8	9.5	9.6	9.3
18	Machines, electrotechnical apparatus, etc.	4,586	4,597	5,507	6,580	8,362	1.0	0.9	1.0	1.1	1.1
19	Fire arms, watches, toys, etc.	748	697	796	853	952	0.2	0.1	0.1	0.1	0.1
20	Miscellaneous	109	107	115	120	84	0.0	0.0	0.0	0.0	0.0
	Total	449,670	487,649	541,719	591,495	737,514	100.0	100.0	100.0	100.0	100.0

Source: Same as Table III.

Unit: 100 tons (37,112 = 3,711,200,000 Kgs.)

[1] Specie is included in 1907 and in 1913.

and imports; and for each commodity the percentage has been calculated of the total quantity of exports or imports during the two extreme years and the three central years of the seven-year period.

TABLE V. — CHANGES IN QUANTITIES OF THIRTY SELECTED COMMODITIES OF GERMAN IMPORTS, 1907–1913

Customs Schedule No.	Commodity	Actual Quantities in Hundreds of Tons					Percentages of Total Quantities				
		1907	1909	1910	1911	1913	1907	1909	1910	1911	1913
	Total Imports	*660,087*	*629,935*	*644,944*	*685,995*	*728,168*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
1	Rye	6,082	2,747	3,895	6,141	3,525	0.9	0.4	0.6	0.9	0.5
2a	Wheat	24,548	24,330	23,437	24,883	25,459	3.7	3.9	3.7	3.6	3.5
3b	Barley	17,910	23,924	28,263	34,779	30,870	2.2	3.8	4.4	5.1	4.2
4	Oats	3,231	5,279	4,577	6,283	5,050	0.5	0.8	0.7	0.9	0.1
7	Indian corn	12,521	7,070	5,731	7,434	9,186	1.9	1.1	0.9	1.1	1.2
23	Potatoes	3,367	3,466	3,106	7,943	3,820	0.6	0.6	0.5	1.2	0.5
28a	Raw cotton	4,764	4,559	4,024	4,440	4,779	0.7	0.7	0.6	0.6	0.7
28e	Hemp	476	419	357	441	456	0.1	0.1	0.1	0.1	0.1
29	Tobacco, leaf	690	762	652	721	813	0.1	0.1	0.1	0.1	0.1
47a	Apples	1,871	2,044	1,220	3,068	4,400	0.3	0.3	0.2	0.4	0.6
51a	Oranges, tangerines	1,015	1,095	1,261	1,213	1,452	0.2	0.2	0.2	0.2	0.2
61a	Coffee	1,896	2,134	1,708	1,831	1,682	0.3	0.3	0.3	0.3	0.2
74e	Oak-timber	1,809	1,171	1,349	1,430	1,347	0.3	0.2	0.2	0.2	0.2
74g	Resinous timber	32,498	26,852	26,907	28,696	28,471	4.9	4.3	4.2	4.2	3.9
97a	Turpentine	1,123	983	1,089	1,116	962	0.2	0.2	0.2	0.2	0.1
144a	Merino wool in the grease	748	906	943	1,012	1,058	0.1	0.1	0.1	0.2	0.2
192a	Bran (cattle fodder)	14,169	12,029	11,286	14,207	14,142	2.1	1.9	1.8	2.1	1.9
193	Oil-cake	7,137	7,313	7,139	7,567	8,284	1.1	1.2	1.1	1.1	1.1
227a	Limestone	4,756	6,352	8,812	8,965	13,185	0.7	1.0	1.3	1.3	1.8
227e	Phosphate of lime	5,795	6,633	7,232	8,332	9,287	0.9	1.1	1.1	1.2	1.3
237e	Iron ores	84,760	83,665	98,168	108,204	140,190	12.8	11.3	15.2	15.8	19.2
237l	Pyrites	7,425	6,912	7,927	8,622	10,239	1.1	1.1	1.2	1.3	1.4
237o	Zinc ores	1,847	2,011	2,405	2,623	3,132	0.3	0.3	0.4	0.4	0.4
238a	Coal, anthracite	137,298	121,986	111,955	109,139	105,400	20.7	19.4	17.4	15.9	14.5
238b	Peat-coal	89,631	81,664	73,977	70,690	69,866	13.5	12.9	11.5	10.3	9.6
239e	Kerosene	9,944	9,520	9,893	9,441	7,454	1.5	1.5	1.5	1.4	1.0
239f	Raw raptta, raw bensine	1,107	1,338	1,464	1,890	1,593	0.2	0.2	0.2	0.3	0.2
361	Thomas phosphate fertiliser	1,643	2,792	3,442	4,037	4,410	0.2	0.4	0.5	0.6	0.6
777'a	Pig-iron	4,436	1,342	1,363	1,313	1,242	0.7	0.2	0.2	0.2	0.2
869a	Copper	1,240	1,546	1,815	1,915	2,253	0.2	0.2	0.3	0.3	0.3
	Total for 30 commodities						73.0	69.8	70.7	71.5	70.4

Source: Same as Table III

The figures establish clearly that there has been no shifting in the composition of either imports or exports which would point to any changes in the physical trade terms themselves. The constancy of the proportions for the several groups and individual articles

is striking. Using Marshall's conceptual device of a "bale" of goods,[6] — each ideal bale containing a due proportion of every constituent article of imports or exports, — we can say that the make-up of the bales

TABLE VI. — CHANGES IN QUANTITIES OF THIRTY SELECTED COMMODITIES OF GERMAN EXPORTS, 1907–1913

Customs Schedule No.	Commodity	Actual Quantities in Hundreds of Tons					Percentages of Total Quantities				
		1907	1909	1910	1911	1913	1907	1909	1910	1911	1913
	Total exports	*449,670*	*487,647*	*541,719*	*591,495*	*737,514*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
1	Rye	2,329	6,505	8,200	7,685	9,338	0.5	1.3	1.5	1.3	1.3
2a	Wheat	972	2,097	2,813	3,099	5,354	0.2	0.4	0.5	0.5	0.7
4	Oats	3,488	3,002	4,365	2,962	6,598	0.8	0.6	0.8	0.5	0.9
176b	Beet-sugar	4,089	3,303	2,925	2,905	3,904	0.9	0.7	0.5	0.5'	0.5
186a	Beer (in casks)	567	537	579	635	667	0.1	0.1	0.1	0.1	0.1
221(a)	Mould	10,980	8,062	13,350	11,773	10,462	2.4	1.6	2.4	1.8	1.4
227a	Limestone	1,194	1,439	1,500	2,053	2,787	0.3	0.3	0.3	0.3	0.4
230(a)	Cement	6,929	6,118	7,258	8,458	11,295	1.5	1.3	1.3	1.4	1.5
234 *c ord*	Rocks, granite, etc.	3,366	4,133	3,953	1,166	574	0.7	0.8	0.7	0.2	0.1
234 *e or f*	Stone	1,453	1,430	1,920	4,485	5,419	0.3	0.3	0.4	0.8	0.7
237e	Iron ores	39,043	28,250	29,526	25,820	26,131	8.7	5.8	5.4	4.4	3.5
238a	Coal, anthracite	200,565	233,507	242,574	274,061	345,735	44.5	47.8	44.8	46.5	46.9
238 *e or f*	Pressed coal	8,377	11,459	15,140	19,588	23,026	1.9	2.3	2.8	3.3	3.1
238 *f or g*	Pressed peat	4,223	4,746	4,741	5,186	8,611	0.9	1.0	0.9	0.9	1.2
280a	Salt & rock salt wares	2,922	3,641	3,704	3,743	4,323	0.6	0.7	0.7	0.6	0.6
317i *or l*	Kalimagnesia (sulph.)	1,283	1,383	1,974	2,825	592	0.3	0.3	0.4	0.5	0.1
319	Anilin & other dyes	437	477	499	524	642	0.1	0.1	0.1	0.1	0.1
361	Thomas phosphate fertiliser	3,991	3,609	4,156	4,994	7,138	0.9	0.7	0.8	0.8	1.0
362	Superphosphates, etc	1,150	1,687	2,117	2,217	2,826	0.3	0.3	0.4	0.4	0.4
543b	Rag-paper	570	496	652	703	826	0.1	0.1	0.1	0.1	0.1
650b	Cellulose (chemical wood-pulp)	931	1,473	1,707	1,659	1,794	0.2	0.3	0.3	0.3	0.2
655a	Printing paper	495	549	629	626	687	0.1	0.1	0.1	0.1	0.1
724a	Fire-proof stone	1,256	1,261	1,379	1,456	1,700	0.3	0.3	0.3	0.2	0.2
737a	Hollow-glass	978	721	907	951	1,171	0.2	0.2	0.2	0.2	0.2
777(a)	Pig-iron	2,751	4,710	7,868	8,321	7,829	0.6	1.0	1.5	1.4	1.1
784	Crucible steel	2,273	4,748	4,944	6,514	7,007	0.5	1.0	0.9	1.1	1.0
785a	Wrought iron	3,917	3,015	3,821	4,081	4,468	0.9	0.6	0.7	0.7	0.6
786a	Tin	1,824	2,246	2,531	2,961	4,608	0.4	0.5	0.5	0.5	0.6
796a	Railroad rails	4,176	3,646	5,157	5,201	5,008	0.9	0.7	0.9	0.9	0.7
892b	Steam locomotives	254	337	313	481	269	0.1	0.1	0.1	0.1	0.1
	Total for 30 commodities						70.2	71.3	70.4	70.5	69.4

Source: Same as Table III

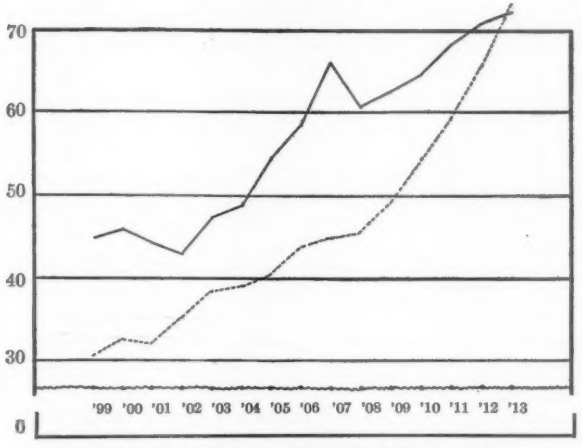
remained the same. It is evident that if for a given quantity of imports Germany had to give an increasingly larger quantity of exports, this was due only to the circumstance that in order to obtain, from year to

6. Marshall, Money, Credit and Commerce, book III, chap. 6.

year, the same amount of imported iron ore, wheat, coffee, and so on, she was compelled to offer in exchange more and more of exported pig-iron, chemicals, coal, and other articles.

We may now bring together in a general table the year-to-year changes of Germany's balance of trade (in physical terms) during the period 1899–1913, compute indices of changes, and construct the corresponding charts.

CHART II.



Germany's Trade Balance in Physical Terms, 1899–1913.
(In Thousands of Tons)

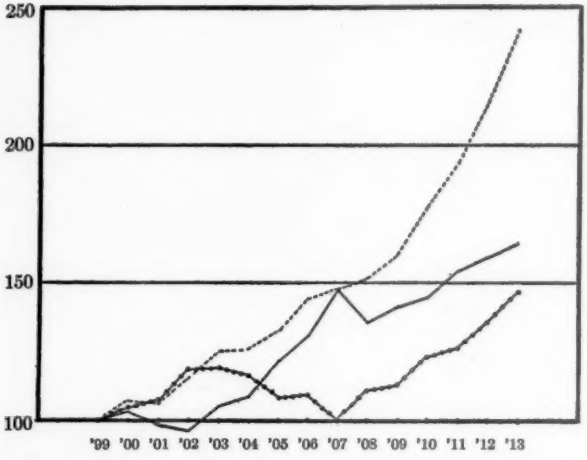
Data in Table VII, p. 677.

——— Imports --------- Exports

The tables and the charts speak for themselves. Throughout this period, the barter terms were becoming less and less favorable to Germany. Measured in relative terms, the exports rapidly outdistanced the imports. This is particularly striking after 1907, when the physical quantities of exports began to grow at a

tremendous pace. Measured in weight Germany had to give in 1913 nearly 50 per cent more of her goods than in 1899 or 1907. If at the beginning of the period she was exchanging one bale of exports for one bale of

CHART III.



Indices of Changes in Germany's Barter Terms of Trade, 1899–1913. Data in Table VII.

——— Imports --------- Exports —o—o—o— Barter Terms

imports, at the end of it she had to give three bales of exports for two bales of imports.

It is true that the very large figures of German exports in 1913, the last year of the period, have been regarded as quite exceptional and accidental. Moulton and McGuire insist repeatedly that it was an extraordinary and abnormal year.[7] But the exceptional nature

7. Germany's Capacity to Pay (New York, 1923), pp. 47 ff. Cf. also G. Hostelet, Quelques considérations économiques sur le problème des réparations (Paris, 1923), p. 9.

of this year, when "German export trade surpassed all records," may be questioned. It would rather appear as a mere continuation of the trend displayed in the previous years, the annual increment-rate for 1913 be-

TABLE VII. — TRADE BALANCE OF GERMANY, 1899–1913 IN PHYSICAL TERMS

(In thousands of tons)

Year	Actual Quantities		Relative Quantities		Barter Terms (4): (3)
	Imports (1)	Exports (2)	Imports (3)	Exports (4)	
1899	44,652	30,403	100	100	100
1900	45,911	32,682	103	107	104
1901	44,304	32,363	99	106	107
1902	43,335	35,030	97	116	119
1903	47,033	38,281	105	126	120
1904	48,885	38,856	109	127	117
1905	54,306	40,566	122	133	109
1906	58,409	43,961	131	144	110
1907	66,009	44,967	148	148	100
1908	60,525	45,879	136	151	111
1909	62,994	48,765	141	160	113
1910	64,494	54,172	145	178	123
1911	68,399	59,150	153	194	127
1912	71,103	65,603	159	216	136
1913	72,817	73,751	163	242	148

Compiled from Statistik des Deutschen Reichs (Neue Folge), Band 261, A, Heft 23, and Monatliche Nachweisen über den auswärtigen Handel Deutschlands.

ing in no way unusual, or even superior to some of the years before it. Table VIII gives the chain relatives of exports, beginning with 1907, for both quantities and values; the index for each year being the ratio of the given year to the one immediately preceding. These indices tell their own tale.

Still another test may be applied, with results to the same effect. Analyzing in terms of value, for these

TABLE VIII. — CHAIN INDEX OF CHANGES IN VALUE AND PHYSICAL VOLUME OF GERMAN EXPORTS, 1907–1913

Year	Values		Quantities	
	Actual	Relative to the preceding year	Actual	Relative to the preceding year
1907	6,845		44,967	
1908	6,399	.93	45,879	1.02
1909	6,592	1.03	48,765	1.06
1910	7,475	1.13	54,172	1.11
1911	8,106	1.08	59,150	1.09
1912	8,957	1.11	65,603	1.11
1913	10,097	1.13	73,751	1.12

Data in Tables I and VIII.
Unit: values in millions of marks; quantities in thousands of tons.

later years, Germany's trade with the six European countries with whom its trade was especially important, and even disregarding the year 1913, we see again how much faster the exports were increasing.

A word must also be said as to some statistical characteristics of the whole period. It falls into two distinct

TABLE IX. — CHANGES IN RELATIVE VALUES OF GERMANY'S TRADE WITH SIX SELECTED COUNTRIES IN 1907–1913

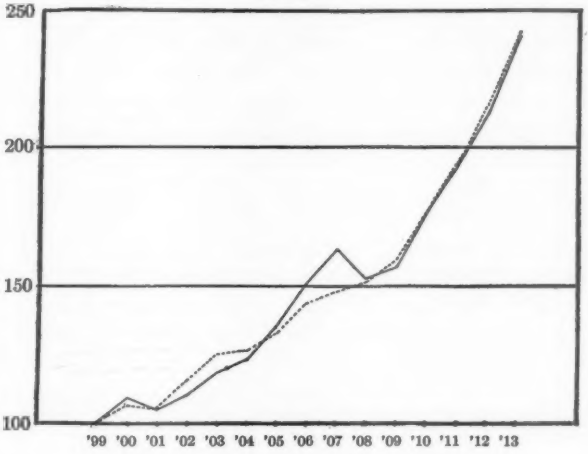
(1907 values = 100)

Country	Imports					Exports				
	1908	1909	1910	1911	1912	1908	1909	1910	1911	1912
Austria-Hungary ...	92	93	93	91	102	103	107	115	128	144
Belgium	88	97	110	114	130	94	102	114	120	144
France.....	93	107	112	115	122	98	101	121	133	153
Great Britain	71	74	78	83	86	94	96	104	107	109
Italy	83	101	96	100	107	103	95	107	115	132
Russia	85	123	125	147	138	103	101	125	143	155

Compiled from Statistik des Deutschen Reichs (Neue Folge), Bände 259, 260.

parts. The *Reichsgesetz* of February 7, 1906, assigned a larger territory to German trade statistics beginning with the 1st of March of that year. The new *Wirtschaftsgebiet*, which took the place of the former *Zollgebiet*, comprised the whole territory of the German Empire with the exception of the island of Helgoland. It now included the free ports of Bremerhaven, Cux-

CHART IV.



Indices of German Exports, 1899–1913
Data in Tables I and VII.

——— Values --------- Quantities

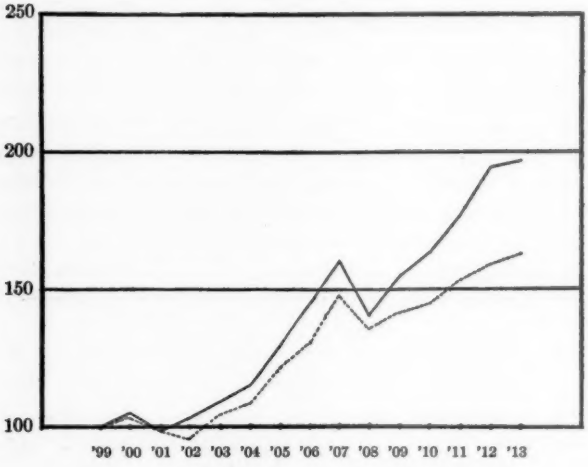
haven, Geestemünde, and Hamburg, as well as the Grand Duchy of Luxemburg and the Austrian communities, Jungholz and Mittelberg. Some readjustments were made in the customs territory of Baden as regards the so-called *badische Zollausschlüsse;* but these were insignificant. Certain changes in methods of classification of the goods were also introduced by the

same law. But the special trade figures were practically not affected by all these changes; the outcome simply was that Hamburg's trade with the rest of the Empire was no longer reflected in the special trade figures. It may safely be concluded that there is no real break in year-to-year comparisons for the period in question. The German statistical office itself never made any such distinction.

The question then naturally arises: what is the reason for this change in Germany's foreign trade terms?

Charts IV and V show that after 1908 there is, as

CHART V.



Indices of Changes in German Imports, 1899–1913.
Data in Tables I and VII.

——— Values ---------- Quantities

regards exports, an absolute correlation between quantities and values. But as regards imports, the quantity

indices lag considerably behind those of values. This difference in the shapes of the curves for values and for quantities of the imports means that the prices of the imported commodities were steadily rising, and shows once more the change in the barter terms. The change might have been due simply to a physical decline in the output (the imports into Germany being chiefly agricultural) resulting from changed conditions of production in the exporting countries. But the rise in import prices could have been brought about as well by another cause. If the countries whence the bulk of the German imports was coming had been borrowers on international account, we should anticipate an impact, on an unchanged volume of their goods, of additional purchasing power. There exists a relation between the net and the gross barter terms of trade.[8] The net terms explain the changes in quantity of exports needed to purchase a given quantity of imports; while the gross terms point to the increase or decrease in the advantage which a country secured from its total foreign trade. Changes in the net barter terms may be related to changes in the invisible items, which again are reflected in the still wider fluctuations of the gross terms; and both may be related to changes in the whole balance of payments in the country's foreign trade.

Let us turn now to the non-merchandise items in Germany's balance of international payments. The two largest and best-known items in her pre-war international account were the earnings of German shipping (in excess of charges for freight carried in foreign bottoms) and the interest and profits payable to her on investments abroad. The income from investments in foreign countries comes, sooner or later, in the form of

8. I refer the reader to the discussion in Professor Taussig's writings, mentioned in note 5 (p. 665).

merchandise imports; while freight charges, being in the nature of exports, are also paid for by imports. The effect of interest on foreign investments, standing by itself, would be inverse from the changes in the barter terms which in fact we have found. The payment of interest causes larger imports than would otherwise come in — more imports for the same volume of exports. Shipping services tend to produce the same result, that is, to swell the volume of imports. Another item was the earnings from the tourist trade, offset only in part by the expenses of Germans travelling abroad. Each summer the numerous German Kur- and Badeorte were swarming with foreign tourists, seeking life and health in the bitter waters of some Brunnen. So far as concerns these credit items, there is nothing to explain the trend of the barter terms.

The only plausible explanation of the growing relative quantity of physical exports — the worsening of the barter terms — seems to lie in an increasing volume of German investments abroad. Great export of capital was a characteristic of this period in many countries. A similar outflow of loans from Great Britain and France took place before the great war. It is true that many of the writers on the subject hold that German investments abroad were then gradually decreasing in amount. It was also generally believed at the time that Germany was economically over-reaching herself, deriving funds for whatever foreign investment she made by short-time borrowings abroad, which were being renewed again and again, or were paid off from the proceeds of new loans elsewhere. There were even those who thought that Germany was forging toward a financial disaster, and sought in the war an escape from an imminent economic catastrophe.[9] Certainly the nation was exert-

9. Cf., for instance, Ch. Bonnefon, "Les causes économiques de la guerre," in Revue de Paris, Jan. 15, 1915.

ing itself to the utmost. But was not this "expansion allemande" due much more to healthy activity in a growing and vigorous body than to the use of an artificial stimulant? I have to question both parts of the statement made by Moulton and McGuire,[1] that "*before the war Germany exceeded her economic capacity as an investor, and yet her new annual investments were gradually decreasing in amount.* Each of these statements is frequently met in discussions of German prewar trade and finance. Taken together they are highly illuminating." No serious proof has ever been adduced to support this view. On the contrary, such evidence as is available tells rather the other way. Karl Lamprecht gave a striking picture of the importance and growth of the export of capital from Germany,[2] and nothing seems to warrant the belief that this movement ceased after the day when he wrote.

TABLE X. — NUMBER OF DAYS MARK EXCHANGE WAS OR WAS NOT DEPRESSED

In terms of	1896–1900			1901–1905			1906–1910		
	Above par	At par	Below par	Above par	At par	Below par	Above par	At par	Below par
Sterling	366	21	395	252	41	489	115	32	932
Francs	265	64	453	43	65	674	50	15	1,014
Guilder	316	36	429	224	42	516	125	28	630

To show that before the war the increase of Germany's foreign investments was rendered possible only by contracting short-time obligations abroad, Moulton and McGuire refer to the course of foreign exchange, using a table published by Dr. Kurt Singer.[3] (Table X.)

1. Germany's Capacity to Pay, App. A., p. 276. Italics in the original text.
2. Zur jüngsten deutschen Vergangenheit (1903), ii (2), pp. 557 ff.
3. Germany's Capacity to Pay, p. 276.

The table shows the number of days in which mark bills of exchange were above par, at par, or below par, as quoted in terms of British, French, and Dutch currencies. (The figures are Berlin quotations.) During the greater part of the period covered, and especially during the last five years (1906–1910), the mark was below the par of exchange, indicating a growing demand for foreign currencies. This brings a theoretical support to the contention that there was a growing pressure of payments *to* foreign countries, such as would ensue from a growth of capital exports. In terms of the Ricardo-Mill analysis, these figures tell the familiar story: loans made to foreigners; then a fall in the price of bills of the lending country; the consequent play of the specie-flow and price-mechanism, bringing about a greater volume of merchandise exports, that is, less favorable terms of trade. Those who dissent from the price theories of the classical school would not agree as regards the mechanism involved, but they would admit that loans, falling rates of exchange, and outward movement of goods, all are links of the same economic chain.

It is particularly instructive to observe the very close correlation between the changes in the barter terms of trade and the low rate of the mark exchange. The more unfavorable the barter terms became to Germany, the larger was the number of days during which the mark was below par. As might have been expected, the low rate was especially pronounced during the last of the three five-year periods.

All the evidence thus points to a maintenance, and even enlargement, of capital exports from Germany, and to this as the explanation of the relative growth of her merchandise exports and her less favorable terms of trade.

An indirect proof of the importance of Germany's

holdings of foreign securities at the outbreak of the war is suggested in Hawtrey's *Monetary Reconstruction*.[4] Mr. Hawtrey calls attention to the circumstance that, whereas the exchanges turned against Russia and Austria at the very beginning of the war, England, France, and Germany were able to maintain their exchanges at par for a much longer time, in spite of the fact that inflation had been going on from the beginning of hostilities. By stopping their foreign investments or liquidating their holdings abroad, the creditor countries could pay for additional imports, and were able to enlarge their internal issues of credit money without an immediate effect in turning the exchanges against them. Germany had large resources of this kind, the result of her pre-war investments abroad.

The main purpose of this paper is to call attention to the possibility of measuring changes in the physical volume of trade when statistics such as those of Germany are available. Unfortunately no German price figures are at hand for import and export goods, and therefore comparison of the results with those obtainable by the price method cannot be made. As regards the trade movements revealed for the period considered, it would seem that the phenomena, especially after 1907, are closely parallel to those of Great Britain during the same period; and they suggest again the great flexibility of international trade, and the quick adjustment of merchandise balances to the balance of total international payments.

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4. Pp. 14, 15 (2d ed.).

THE COPPER-MINING INDUSTRY IN THE UNITED STATES, 1845–1925

II. Industrial Organization

SUMMARY

I. The Lake; Calumet and Hecla. — Early Organization, 684. — Mergers, 687. — Calumet and Hecla, 688. — II. Butte; Anaconda. — Early mills and smelters, 689. — Consolidation of operations, 692. — The Anaconda, 693. — III. Arizona; Phelps Dodge; Porphyries. Special characteristics, 698. — Phelps Dodge and Bisbee, 699. — Globe, Clifton-Morenci, and Jerome, 703. — IV. American Smelting and Refining Company. — Influence of the Guggenheims, 707. — Tie-up with the Porphyries, 709. — Braden, Kennecott, and Chile, 709. — Present Importance of the Company, 712. — V. Conclusion, 712.

From the lone prospector or the small group of miners working an isolated deposit in desert country in the Far West, to the Anaconda Copper Mining Company or the American Smelting and Refining Company is a far cry. Between these limits is a wide range of possible types of industrial organization, and of possible lines of evolution of organization. Many of these types and many of these lines are to be found in the history of the copper industry of the United States. The purpose of the present article is to set forth some of the principal facts in the story of the industry that bear on organization development, and to indicate the principal reasons for that development.[1]

I. The Lake; Calumet and Hecla

The existence of the Lake copper deposits was so well known that when, after the cession of the lands

1. The article will take for granted a knowledge of the facts presented in previous articles by the writer in the February, 1927, and February, 1916, issues of this Journal, especially the former.

from the Indians, they were first opened for exploitation, hundreds of locations were made over the wide extent of the copper-bearing area,[2] most of which naturally were operated on a pretty small scale. Mass and barrel[3] copper, requiring no concentrating, were at first the predominant forms of mine product. Nevertheless, already in 1846, the Lake Superior Copper Company, we read, had "in operation, carried by water power, a stamping and crushing mill, and also a saw mill, improvements which no other company has."[4] So far as the writer has been able to learn, there has been at the Lake little joint use of mills, despite the small scale of output of many of the mines. "Mineral" (concentrates) and mass and barrel copper were at first sent out of the district, to Pittsburgh, Cleveland, and Detroit (after Boston and Baltmore), and also to Hancock, Michigan, on Portage Lake. The Hancock works had the advantage of being the nearest of all to the mines, but were farther from supplies of labor and fuel and flux, than the others. The Detroit and Lake Superior Copper Company, operating the works at Detroit, absorbed, in the fifties, the works at Hancock — the first instance, at least of any note, of horizontal combination in the metallurgical branch of the industry.

2. For early organization history at the Lake I draw on the references mentioned in my previous article and also on James Douglas, "Historical Sketch of Copper Smelting in the United States," in Mineral Industry, iv, 269–286; T. Egleston, "Copper Refining in the United States," in Trans., A. I. M. E., xiv, 678–730 (1880–81); Egleston, "The Point Shirley Copper Works," in School of Mines Quarterly, vii, 360 (1886); an article, "Baltimore Copper Works," in Eng. Min. Jour., xxxii, 87 (1881); H. D. Conant, "Copper Smelting in Michigan," in School of Mines Quarterly, xxxii, No. 4 (1911); Stevens, Copper Handbook, early volumes.

3. Mass copper is native copper in masses weighing up to a number of tons. Barrel copper is copper in lumps small enough to be transported in barrels.

4. Reports of Wm. A. Burt and Bela Hubbard on the Geography, etc., of Lake Superior.

While, with the growth of population and hence an increased labor supply in Michigan, and the cheapening of transportation, all smelting and refining, like the milling of ores, came to be done in the copper district itself, only two Michigan mines have ever owned their smelting works outright. These are the Calumet and Hecla and the Quincy. The only other smelter now in existence and operating at the Lake is jointly owned, and does custom smelting for its owners and for others.[5]

Leaner ore soon succeeded the rich deposits found near the surface, and even improved mining and reduction methods could not stave off decline and death for a number of the enterprises. Then came the opening of

5. It is highly important to note here the striking contrast between the huge amount of rock mined and the small amount of mineral smelted in Michigan as compared with other states. In 1910, for example, when Arizona, Montana, and Michigan each produced between 200,000,000 and 300,000,000 pounds of copper, the tonnages mined and smelted were as follows (tons "mined" being tons concentrated plus tons smelted without milling):

State	Tons Mined	Tons Smelted	Tons of Copper Produced
Arizona	3,644,495	2,477,643	148,000
Montana	4,517,709	1,775,810	142,000
Michigan	10,869,561	180,420	111,000

Even in 1925, when very little Butte ore was being smelted without prior milling, and when the porphyry deposits were contributing a large part of the Arizona output, whereas they were of no significance in 1910, the figures were as follows for the same three states and for Utah:

State	Tons Mined	Tons Smelted	Tons of Copper Produced	Yields of Tons Smelted
Arizona	18,264,700	3,618,707	325,000	9%
Montana	3,278,662	1,482,994	119,000	8%
Utah	12,357,366	653,303	112,000	17%
Michigan	5,372,572	106,890	68,000	64%

(The Arizona figures for 1925 do not include leached ore or the copper product thereof.)

With such a small smelting capacity needed at the Lake, the reason for the concentration thereof is clear enough. The foregoing figures, of course, are those of the U. S. Geological Survey, and the Bureau of Mines.

the Calumet and Hecla and other mines in the Portage Lake district, and the consequent great cheapening of copper, with the result that the mines in the Keweenaw and Ontonagon districts gradually faded from the list of producers, except as ore was mined by tributers.

From 1860 on, there have been few years in which more than twenty mines in the whole Lake district marketed as much as 100 tons of copper apiece. That most of these have produced at all has been due chiefly to that persistent obstinacy which seems to characterize mine-owners. Physical factors, such as distance and vein locations, and probably also a generous dose of individualism, militated against combinations. In the Portage Lake district, mergers of properties at times only brought about redoubled efforts to continue operations and make profits out of the extremely lean rock. The Isle Royale mine affords a good example. It was a merger, in 1899, a year of high copper prices, of a number of mines, none of which had ever paid a dividend, tho some of them had been operated on and off since 1853. The Isle Royale Copper Company paid its first dividend in 1913 (it had by that time become a Calumet and Hecla subsidiary), whereupon representative citizens of the town of Houghton tendered a dinner to the manager and some of his official family!

Apart from mergers of adjoining properties, of which there have been a number of examples, there have been only a few instances of horizontal combination among the Michigan copper mines — not as many as might perhaps have been expected, in view of the large number of mines opened, the smallness of copper output of the average mine, and at the same time the large tonnage of rock that must be raised per ton of copper output. The old Calumet and Hecla of 1871 was a merger of adjoining properties. So was the famous old Atlantic

mine and also the Quincy and the Osceola, altho the last-named in 1897 absorbed also three allied but disconnected mines, all of which were under control of the Bigelow interests. In the late eighteen-nineties, several other minor consolidations took place, and in 1901 occurred an important horizontal combination, the formation of the Copper Range Consolidated Company to unite control of the allied Baltic, Trimountain, and Champion mines. The Copper Range Company, which has succeeded the Consolidated Company, now owns the assets of the former Baltic, Trimountain, and Atlantic mining companies and half of the stock of the Champion Copper Company, controls, directly or indirectly, a majority of the stock of the Michigan Smelting Company, and owns all of the stock and some of the bonds of the Copper Range Railroad Company.

The present Calumet and Hecla Consolidated Copper Company was incorporated in 1923 to consolidate the Calumet and Hecla Mining Company and four of its subsidiaries, the Ahmeek, Allouez, Centennial, and Osceola companies.[6] The old company began to purchase stock in other companies in 1905–06, its first purchases being in companies none of which was operating on property contiguous to the Calumet. Later, shares of stock in the Osceola, Allouez, and Centennial companies were bought, all operating on a lode which ran through the Calumet's land. In 1908 stock was bought in other mines, notably three Bigelow properties, the Isle Royale, the Tamarack, and the Ahmeek, of which only the Tamarack was contiguous to the Calumet. These purchases apparently were largely of the nature of a "depletion reserve," using surplus cash, as well as

6. See New York Stock Exchange listing applications A–6081 and A–6121. Also annual reports of the Calumet and Hecla (both old and new companies), especially for the years 1905–09, 1915, and 1923–26.

a buying into neighboring properties with which the Calumet rather vainly hoped promptly to secure "economical coöperation." In 1911 an attempted consolidation of all but one of the subsidiary companies with the Calumet was blocked by litigation carried on by persons friendly to Albert S. Bigelow, and it was abandoned.

The present Calumet and Hecla, in addition to the properties of the four merged companies, owns stock in the Isle Royale and a few other companies, including the company which owns the famous old Cliff mine. It controls the Mineral Range Railroad and owns extensive timber lands. In addition, as has already been indicated, it is, of course, completely equipped with reduction works and maintains its own selling agency. The Calumet and Hecla is the most completely integrated organization at the Lake, as well as the foremost producer of copper there, and much the richest and most famous of all Michigan copper organizations.

II. Butte; Anaconda

The story at Butte is quite different from that at the Lake, both at the beginning and in its unfolding.[7] The difference was inevitable from the compactness of the copper area and the character of the deposits, both their richness and the complexity of the vein system entering in as factors affecting the development. At the inception of copper-mining operations on an important scale in the early eighteen-eighties, production came from a considerable number of rich mines all found within an area of a few square miles. Properties were rather

7. For Butte history, I draw chiefly on Douglas and Egleston, op. cit.; E. P. Mathewson, "The Smelters at Anaconda," from "A Souvenir of Anaconda's Silver Jubilee," in Eng. Min. Jour., lxxxvi, 130 ff. (1908); references in previous article; and New York Stock Exchange listing application A–3826.

rapidly consolidated and the number of operating companies notably reduced. The rich Anaconda soon took in the so-called Chambers Syndicate mines adjoining the Anaconda claims.[8] The Montana Copper Company combined several properties and later itself became one of the constituent parts of the Boston and Montana Consolidated Copper and Silver Mining Company, formed in 1887. In the same year, the Butte and Boston Mining Company was formed to unite the Silver Bow Mines and others. There were doubtless other early consolidations. In amost any mining camps, the joining of claims is a common phenomenon. It is particularly desirable for both operating and legal reasons where such a complex vein system obtains as at Butte.

The richness of the ores in the early days of Butte as a copper camp might have been expected to make the concentration of ores inadvisable because of its wastefulness. Milling is resorted to, however, to lessen the work that has to be done by the furnaces — in other words, to lessen the expense for fuel and flux. The isolation of Butte and the silicious character of the ores made it especially necessary to accomplish this result. The first concentrator in Butte was put up as early as 1881, and virtually every mine of any importance soon had a mill of its own. In some cases, ores running over 10 per cent copper were milled, with huge copper and silver losses.[9] Fuel was dear, while copper was "the cheapest thing in Butte." Even so, the richness of the ores naturally greatly reduced the metallurgical plant

8. Eng. Min. Jour., xxxiv, 165; J. Douglas, "The Copper Industry of the United States," in Iron Age, lvii, 3.

9. See C. W. Goodale, "The Concentration of Ores in the Butte District, Montana," in Trans., A. I. M. E., xxvi, 601; E. D. Peters, "The Mines and Reduction Works of Butte City, Montana," in Mineral Resources for 1883–1884, pp. 384 ff. Peters writes that ore was divided into "at least" two classes: the first class, 20 per cent ore or better; the second, 10–18 per cent ore, which was concentrated.

needed, bringing also such quick and large profits as greatly to facilitate development, both horizontally and vertically.

Smelters were also soon in evidence. Indeed the first smelting plant, that of the Colorado Smelting and Mining Company, was begun two years before the first mill was erected.[1] The Montana Copper Company, the Parrot Company, and the Anaconda followed suit in the next few years, and four other smelters were erected at or near Butte in the eighties. For the Anaconda works a site, named Anaconda, was chosen, 26 miles from Butte, where there was a plentiful water supply and where the operations would not inflict the inevitable smoke nuisance on Butte. For a while the final product of all these plants was matte.

All but one of the smelters were erected by companies that owned mines and that wanted reduction works primarily for their own ores. The one exception, the Colorado smelter, later integrated downwards by buying mining property. All the smelters probably did a certain amount of custom business, and there have always been at Butte properties large and small that lacked smelters of their own. The matte product went east to the Atlantic coast or to England, until, following the lead of the Parrot, the companies began to install converters and turn out blister copper. The final step was taken by the Anaconda, when in 1892 it built an electrolytic refinery to treat part of its blister copper, sending the rest, as in the past, to Baltimore. Meanwhile, the Boston and Montana had begun the erection of a notable plant at Great Falls, where complete smelting and refining operations, including electrolysis, were later carried on. This company and the Anaconda were

1. H. O. Hofman, "Notes on the Metallurgy of Copper of Montana," in Trans., A. I. M. E., xxxiv, 259.

therefore the first in the United States to be thoroly integrated through the stage of the production of electrolytically refined copper.

Tho in the early nineties F. A. Heinze's Montana Ore Purchasing Company erected reduction works of its own on the outskirts of Butte to engage in custom business as well as to treat its own ores,[2] this decade witnessed the beginnings of the gradual closing down of smelting works at and around Butte, and the concentration of operations principally at Great Falls and Anaconda. By 1915 but one smelter was left in Butte or its suburbs, the property of the Pittsmont Copper Company in East Butte, which was built in 1903 and has operated most of the time since then on both company and custom ore.

At Butte, as elsewhere, there have been two reasons above all others for the disappearance of the other smelters. One is the consolidation of mining properties and the other the economic necessity for large-scale operations and for the application of the most advanced metallurgical knowledge and skill, particularly as the yield of the ores has declined. The concentration of control has in good measure made possible the metallurgical advances. The Boston and Montana, upon erecting the Great Falls plant, scrapped its several smelters at Butte. The Amalgamated later came to control all but a few of the important producing mines of Butte, and then the Anaconda to own them. It was but natural that out-of-date, relatively inefficient plants belonging to some of these companies should be dismantled, and all the ore and concentrates go either to the works at Anaconda, or to Great Falls. In the case of Western sulphide ores, complex and heterogeneous as many of them are, large-scale operations are desirable,

2. See Hofman, op. cit.

not only because of the obvious economies, but because size brings with it adaptability and flexibility of operation, at any one time and over a period of time. It is no wonder that when the North Butte Mining Company was organized in 1905 and soon became the most important producer in Butte next to Anaconda, arrangements were at once made for sending all the ores to Anaconda. The North Butte has not had even a concentrator of its own.[3]

The electrolytic refining of Butte copper has been even more closely concentrated than the smelting and furnace refining. The Great Falls plant has, practically from its inception, turned out electrolytic copper. Anaconda partly depended for a dozen years or so on Baltimore, but then did all its own electrolytic refining. The Parrot sent its blister copper at first to the Balbach refinery at Newark, New Jersey, and later to a refinery which it controlled at Bridgeport, Connecticut. The latter, like the Parrot smelter, was abandoned after the Amalgamated secured control. Other works on the Atlantic Coast have at one time or another refined Butte copper. At present, however, unless there are trifling exceptions, the electrolytic refining of Butte copper takes place at one of the two Anaconda refineries, namely, at Great Falls or at Perth Amboy, New Jersey.

The Anaconda Copper Mining Company is now more fully integrated and has more widely scattered operations than any other organization in the non-ferrous metal industry of the United States.[4] Completely in-

3. The North Butte has almost vanished from the picture as a producer of copper. For several years past, its only output has come from the operations of lessees. In 1926 it voted to absorb the Tuolumne Copper Company, another small producer. (Mines Handbook, xvii, 1095.) It has just gone into a receivership.

4. On the organization of the Anaconda, see the company's annual reports; Mines Handbook, vol. xvii (1927); and New York Stock Exchange listing applications A–4346, A–5586, A–6084, and A–6621 (Andes Copper Mining Company).

tegrated in copper production, it also owns coal mines near Anaconda and in Wyoming. The mines at Butte are timbered with the company's own timber, cut in its own sawmill. The Anaconda and the Chicago, Milwaukee and St. Paul control the railroad which connects Butte and Anaconda. At Anaconda a sulphuric acid plant, using the sulphur in the furnace fumes, supplies acid for metallurgical uses and for making fertilizer, also at Anaconda, from phosphate rock mined by the company in Idaho.

In 1926 the reduction works at Anaconda produced from the company's ores 254,000,000 pounds of copper, and as by-products, 8,226,724 ounces of silver, 31,764 ounces of gold, and 6,864,700 pounds of arsenic, and turned out a small amount of copper and by-products from other ores. The copper output of the Anaconda works went up to Great Falls, where the electrolytic refinery turned out 243,000,000 pounds of cathode copper, melting most of this into shapes for shipment elsewhere, or for rolling at Great Falls. A rod and wire mill there rolled some 168,000,000 pounds of copper into wire rods, drew about 41,500,000 pounds of these into wire, and shipped nearly a third of the rods to a wire plant of the controlled American Brass Company.

At Perth Amboy, New Jersey, the big Raritan works refined for Anaconda subsidiaries, affiliates, and others, 393,000,000 pounds of copper, turning out also large amounts of silver and gold and various amounts of nickel, platinum, selenium, tellurium, and palladium, as well as copper sulphate. At Rutherford, New Jersey, a plant of a subsidiary made copper-clad shingles. In Connecticut, and in New York, Wisconsin, and Canada, the American Brass Company, the greatest consumer and fabricator of copper in the world, whose stock is en-

tirely owned by the Anaconda, turned out copper, brass, and other products to an amount in excess of 686,000,000 pounds. Down in Arizona is the Inspiration Consolidated Copper Company, about 30 per cent of whose stock the Anaconda owns. The ores and concentrates of the Inspiration as well as those of the neighboring Miami Copper Company, the Old Dominion at Globe, Arizona, and other custom material, are treated at a large copper smelter and refinery of the International Smelting Company, which is wholly owned by the Anaconda. The Smelting Company also owns, at Tooele, Utah, a copper smelter, a large lead refinery, a zinc concentrator, and a railway company. The Anaconda and the Inspiration jointly own an oil company in California.

The 30,000-odd shares of stock of the Greene Cananea Copper Company of Mexico, which Anaconda acquired from the Amalgamated, constituted the first foreign property owned by the Anaconda, but the least important. Quite overshadowing all others is the majority interest which the Anaconda has in the Chile Copper Company, which owns the stock and controls the operations of the great Chile Exploration Company at Chuquicamata, Chile, producers in 1926 of some 220,000,000 pounds of copper. In Chile also is the wholly owned Andes Copper Mining Company at Potrerillos, whose mine has been under development and its metallurgical plant under construction for a number of years, and which turned out its first commercial copper in January, 1927. And the Anaconda controls through stock ownership the Santiago Mining Company, which holds large tracts of land in Chile on which prospecting has indicated a large tonnage of low-grade ore that the Anaconda has not yet found it feasible to develop.

But the Anaconda has not confined its operations to copper, tho much the greater part of its revenues comes from that metal and its products. In the last decade the company began to develop and exploit deposits of zinc found on its property in Butte. Experimental work in zinc concentration was followed by the erection of complete zinc reduction works at which the Anaconda has been treating not only ores from its own mines, but ores purchased from other producers in Butte. In 1926, indeed, the mines of the company furnished only 4 per cent of the total amount of zinc ore concentrated at Anaconda. These concentrates and other zinc ore and concentrates, including those from the Butte Copper and Zinc Company, more than 25 per cent of whose shares the Anaconda owns, were treated in the electrolytic zinc plant which the Anaconda had erected at Great Falls, which turned out 236,000,000 pounds of zinc, nearly 23,000,000 pounds of lead, and by-product copper, silver, and gold. The company's subsidiary, the American Brass Company, naturally constituted a large market for this zinc.

Nor is this all. The International Smelting Company, which has already been mentioned, not only refined an enormous quantity of copper, but at Tooele, Utah, turned out 135,000,000 pounds of lead and by-product silver, gold, and arsenic. Lead bullion from this plant and elsewhere went to the International Lead Refining Company at East Chicago, Indiana, an Anaconda subsidiary, where common desilverized lead, antimonial lead, and silver and gold were turned out. At East Chicago, too, white lead and also zinc oxide were produced by the Anaconda Lead Products Company; still more of the latter was produced by the company's plant at Akron, Ohio, convenient to the great rubber industry of that town. In 1926, finally, through

a holding company created for the purpose, a majority of whose stock the Anaconda Copper Mining Company owns, all the stock of the Giesche Spolka Akcyjna, operating zinc mines in Polish Silesia, and also bonds of the Bergwerksgesellschaft Georg von Giesche's Erben, the former owner of the Giesche Spolka stock, were acquired.

Such are the principal ramifications of this great organization. It represents the utmost of integration to be found in the non-ferrous metal industries of this country, and as great a measure of horizontal combination, all things considered, as the American Smelting and Refining Company. Save for the fact that the purchases of coal and timber lands naturally came after the development of the Butte mines, integration has been characteristically upward. The company has come into possession of raw materials, and then out of earnings, or through the sale or exchange of stock, or in the last ten years through bond issues, has rounded out and widened out its organization. In the main, the development has been logical enough, tho, to be sure, some of the purchases, especially of minority interests in other mining properties, have not been called for by organization needs. Through the selling organization which first the Amalgamated controlled and which came into the possession of the Anaconda when the Amalgamated was dissolved, Anaconda has always vied with the Guggenheim interests as a factor in the marketing of copper, tho for some time it has held second place; and since the acquisition of the American Brass Company the Anaconda sales organization has put much less copper into the open market than have the Guggenheims. Including the copper that goes to the American Brass Company, the Anaconda probably disposed in 1926 of between 25 and 30 per cent of all the

virgin copper of domestic or foreign origin, some 1,250,000 tons in all, which American interests sold in that year. Guggenheim interests probably disposed of about 40 per cent of the total.

III. Arizona; Phelps–Dodge; Porphyries

Before passing to the American Smelting and Refining Company and the allied porphyries, let us consider a few of the old camps in Arizona. Surface ores, as well as much underground ore in some of the principal camps in Arizona, were oxides and carbonates, and when sulphide ores and sulphurets succeeded these in quantity, they, like the oxides and carbonates, did not admit of concentration or did not require it. Mills were therefore a rarity in Arizona until quite recently.[5] Smelters, on the other hand, were numerous. The earliest furnaces were primitive affairs and the pyrometallurgy was of the simplest. This helped to counteract the rather high-cost mining operations which soon became characteristic of the Arizona copper industry in the old camps, and the isolation of the state and of its copper camps. As a result, all the mines of any consequence naturally had their own furnaces, and from these furnaces did not ship matte,[6] assaying only about 50 per cent copper, but pigs or other forms of copper assaying better than 90 per cent. For a good many years, indeed, Arizona casting copper, about 99 per cent fine, was a definite factor in the copper market for uses which did not require the finest metal. Later it came only from a few camps whose copper had so little precious metal content as not to pay the cost of

5. The Clifton-Morenci camp formed an important exception to this.

6. Of course, we are speaking now of the great camps developed from the late eighteen-seventies on, not the isolated and short-lived enterprises of the sixties.

electrolytic refining; and it is now of little importance.

Along with the richness of Arizona ore and the simplicity of the metallurgy went one other important factor which had a great influence on the lines of development of copper-mining in the old camps of that state. This was the fact that until the twentieth century the greater part of the copper produced in Arizona was the output of companies whose stock was very closely held.[7] This was quite a different situation from that obtaining at either the Lake or Butte, the stocks of many of whose important mines were actively traded in on State Street in Boston.[8] Development of the closely held Arizona mines could proceed without any attention to what speculative interests might desire, and copper-marketing policies could also be developed quite independently of any other interest. It also happened that after a relatively few years practically all the copper production in each of the four principal camps of the state up to the end of the nineteenth century came from only one or two or, at most, three mines. Here again we have a situation quite different from that which obtained either at the Lake or at Butte.

The two principal organizations in Arizona at the present time, from the point of view of the volume of copper controlled, are the Phelps-Dodge Corporation and the Calumet and Arizona Mining Company. Both of these concerns have developed into horizontal combinations. It will be recalled that the Queen was, early in its career, taken over by members of the old firm of

7. Such was the case with the Copper Queen at Bisbee, the Arizona Copper and Detroit Copper at Clifton-Morenci, the United Globe deposits at Globe, and the United Verde at Jerome, during some or all of the period of their operations in the eighties and nineties.

8. Butte mines, to be sure, were generally closely held through the eighties.

Phelps, Dodge and Company.[9] (These same interests, incidentally, had been in the Ansonia Brass and Copper Company, fabricators in Connecticut.) About a decade later Phelps, Dodge and Company secured the Detroit Copper Company, at Morenci, and in 1895 they formed the Moctezuma Copper Company, to take over from the Guggenheims mining property near Nacozari, Mexico. Until 1908, the firm of Phelps, Dodge and Company held the stocks of these concerns, and of the Stag Canon Fuel Company, which owned coal land in New Mexico "purchased in 1905 to secure for the copper mines of the Southwest a certain and steady supply of coal and coke." In 1908, the corporation of Phelps, Dodge and Company was formed to merge the four properties, and this was succeeded in 1917 by the Phelps-Dodge Corporation, the present organization, which operates the properties and some minor ones, in addition to having, since the war, purchased the Arizona Copper and Shannon Copper properties at the Clifton-Morenci camp.

As the Copper Queen, in the eighteen-eighties and nineties, absorbed various other properties at Bisbee, concentration of smelting took place, as at Butte. Then greatly enlarged smelting works were required, and in 1904 a new plant was opened at a point near the Mexican border, christened Douglas, on the main line of the El Paso and Southwestern Railroad, which Phelps-Dodge interests controlled. There the products from Bisbee and Nacozari are treated — the ores from the Queen's high-grade deposit, the concentrates from Sacramento Hill, and from Nacozari — and some cus-

9. See volumes of Mineral Resources for the eighteen-eighties; New York Stock Exchange listing application A-3615; Poor's Manual of Railroads, 1881, advertisement, p. 3; James Douglas, "The Copper Queen Mines and Works," in Trans. Inst'n Min. and Met. xxii, 532 ff. Phelps, Dodge and Company was formed in 1828.

tom ores. The mines at Clifton-Morenci have had their smelters from the beginning, and a smelter at Clifton is still doing all the furnace work for that camp. Both from Douglas and from Clifton, copper goes to the Atlantic seaboard for refining on a toll basis. In the earliest days of Bisbee, pig copper went to Baltimore, Boston, or Ansonia, then for many years to the Nichols Copper Company refinery on Long Island. Lately, Phelps-Dodge copper has been refined by the American Smelting and Refining Company. The Phelps-Dodge people, however, have always sold their copper, and still do, and sell a substantial amount of other copper, chiefly the output of their Bisbee neighbor, the Calumet and Arizona, and that of the Old Dominion, at Globe, an affiliated but not consolidated organization. In 1926, copper sales by the corporation amounted to 276,000,000 pounds of the metal. Small amounts of by-product lead, silver, and gold were also sold.

This organization is of interest chiefly for four reasons other than its size and importance in the industry:

1. Beginning as a group interested in copper fabrication, it soon developed into an enterprise devoted purely to raw copper production, and never integrated from that up into fabrication, or vice versa.

2. It was the earliest important horizontal combination which encompassed widely separated camps.

3. From the beginning it has tended to play a lone hand in the copper market, especially in the early days when it still had its affiliation with manufacturing; tho it presumably coöperated with the Copper Producers' Association in releasing statistics before the war, and since the war has been a member both of the Copper Export Association, and of Copper Exporters, Inc.

4. It is the only one of the pre-war Big Four of the copper-mining industry which did not possess its own

refining facilities. Doubtless this is due, to no small extent, to the fact that for many years the products of both the Queen and the Detroit smelters went direct to the market without refining other than what those smelters carried on.

The Queen's two neighbors, the Calumet and Arizona and the much smaller Shattuck Arizona (since 1925, following a merger, the Shattuck Denn Mining Corporation) represent even less integration, for they sell their copper through Phelps-Dodge, and the Shattuck has its output smelted at the Calumet's works at Douglas. The Calumet at first sent its ores to the Queen's smelter, but its own rapid growth naturally caused it to erect works of its own at Douglas. The Calumet, it will be recalled, controls the New Cornelia, at Ajo. It manufactures sulphuric acid at Douglas, to be shipped to Ajo for the leaching plant of the New Cornelia. Such of the latter's copper as is not leached and electrolytically deposited goes to Douglas for smelting. With the rest of the blister, produced at Douglas, it goes to the American Smelting and Refining Company for refining.

At Globe, which did not enjoy railroad connections until 1898, and is 140 miles from the main line of the Southern Pacific, smelting in adobe furnaces dates back to 1878.[1] The Old Dominion mine, which represented the merging of various adjoining properties, came in 1886 under the control of the Keysers, of Baltimore, who were operating the Baltimore Copper Smelting and Rolling Company, and its direct-smelted pig copper went to Baltimore.[2] The Bigelow-Lewisohn group se-

1. L. A. Ricketts, "The Growth of the Globe District," in Eng. Min. Jour., cii, 706.

2. Ransom, Globe Folio of the Geological Atlas of the U. S.; Maryland, Its Resources, etc., p. 117; Eng. Min. Jour., lix, 515, 567; lx, 60; New York Stock Exchange listing application A–4555.

cured control in 1895, and finally, after one more change of management, the mine came into the hands of the Phelps-Dodge interests, who merged it in 1904 with the neighboring United Globe mine, which they owned, to form the Old Dominion Company. For a while, the Old Dominion sent some of its ores to the smelter of the affiliated Queen, at Douglas, as flux, and received sulphide ores from the Queen mine for matting purposes. Numerous smelting works have operated in the past at Globe, but today, no smelting works are operating there, for Globe ores and concentrates go to the International smelter at Miami, where they are mixed with Inspiration and Miami concentrates. As has already been said, Phelps-Dodge sells Old Dominion copper. Little other copper is produced at Globe; the Arizona Commercial Mining Company is the only other producer of any size.

If Globe was 140 miles from a railroad, the Clifton-Morenci district, when it was opened in 1872, was 700 miles from the nearest railroad station, in Colorado.[3] Nevertheless, production began at once and ores were smelted in adobe furnaces. The Longfellow mine, and others controlled by the Lezinsky brothers, and the properties of the Detroit Copper Mining Company, were the first to operate. Early in the eighties the Lezinskys' interests were bought by the Arizona Copper Company, Ltd., formed by Scotch capitalists. Soon afterwards this company built a narrow-gauge railroad to connect with the Southern Pacific in New Mexico. Numerous concerns have operated in the district, but most of them either succumbed or were absorbed by the Arizona or the Detroit. A newcomer of importance, the Shannon Copper Company, was formed

3. W. Lindgren, The Copper Deposits of the Clifton-Morenci District, pp. 33 ff.

in 1899 to operate claims bought from the Arizona. It was another product of that high-price period which produced various discoveries and developments at Bisbee, at the Lake, in Utah, and elsewhere.

Each of the three Clifton-Morenci mines has been integrated through the smelting stage, and the Arizona, from the early eighteen-nineties on, leached copper from some of its low-grade ores, using acid made at its smelter. The Arizona and the Detroit properties have sold most of their output of the last half-century in the form of pig copper, low in precious-metal content and sufficiently pure for casting purposes. The Arizona, while it was an independent property, therefore had little interest in forward integration. The district is of much historical interest because of its early development, the rather rapid concentration of properties, the character of its product, the early date at which the problem of exploiting a blanket-type of low-grade deposit was met, the necessity of building mills for the greater part of the ore, the early use of leaching, and the final merging of the three important producers into the Phelps-Dodge organization.

Little need be added to what was said in the previous article about Jerome. The ores there have not been amenable to milling and have gone direct to the smelters. For a time United Verde pig copper went to the Waclark Wire Works at Elizabeth, New Jersey, to be refined and drawn. This was given up, however, and copper now goes to the U. S. Metals Refining Company plant at Carteret, New Jersey, to be refined, and is sold either by the company's officers or by the United States Smelting, Refining and Mining Company. James S. Douglas, son of the late president of Phelps, Dodge and Company, was one of those chiefly responsible for the successful development of the neighboring United

Verde Extension mine. The company's ores went first to the Copper Queen works for smelting and to the Nichols Copper Company for refining, thus taking the same route as Phelps-Dodge copper from Bisbee. Soon, however, a smelter was built a few miles away from the mine. Nichols still refines, and also sells United Verde Extension copper.

This covers all the principal camps in Arizona, except Miami and Ray; which brings us to the "porphyry" coppers. In every case, the existence of these porphyry deposits was known for years before they were exploited on the present basis. But small-scale operations were economically quite impossible on these huge, low-grade deposits. Without exception, the final development in its present form has come only after drilling campaigns established clearly a huge tonnage, and engineering calculations determined on mining and metallurgical methods of operation. As was observed in the previous article, both stock and bond issues were floated to finance the construction of the necessary surface plant and the early development of the deposit. In no case, whether the porphyries were affiliated with the Guggenheims, Anaconda, or the Lewisohns, has one of these mines been integrated vertically beyond the ownership of a mill, — which is virtually no integration at all, — except for Nevada Consolidated, which owns a smelter. Whatever other financial motives may have prompted this, it was clearly advantageous to the mines not to burden them with the expense of a smelter and the fixed charges from financing such construction, if an affiliated company owned or could construct a nearby smelter. (The isolation of the Nevada Consolidated mine made it desirable for it to provide its own reduction works.) A subsidiary of the Anaconda built

a smelter to treat the concentrates of the allied Inspiration and also of the Miami Copper Company. In the case of the Utah, Ray, and Chino companies, smelting facilities were provided by the American Smelting and Refining Company.

The most important purely copper-mining horizontal combination, of course, exists with four of the porphyries as important constituents. As early as 1910, the allied Utah Copper and Nevada Consolidated companies were united as parent and subsidiary, respectively, through the acquisition by the Utah of just over 50 per cent of the stock of Nevada.[4] Then, in 1915, as is related a few pages further on, the Kennecott Copper Corporation acquired from the Guggenheim interests a large block of Utah stock, and at the same time made provision for acquiring, through exchange of stock, all the stock of the Braden, in Chile. Today the Kennecott owns all but a small block of the shares of the Utah. In 1924, the allied Ray and Chino were merged by having the Ray exchange its stock for that of the Chino, and dissolve the latter; and then in 1926, the Nevada bought out the Ray, through the issuance of stock and bonds. Thus the Nevada Consolidated is now, after the manner of the Phelps-Dodge Corporation, the owner of three widely separated mining properties, and is itself controlled by the Utah, which in turn, along with the Braden, is controlled by the Kennecott. The last named also has a working control of its neighbor, the Mother Lode. The Kennecott group represents copper production totalling not far from 750,000,000 pounds a year, and is much the largest horizontal combination in the industry. The output from domestic mines alone (that is, excluding the Braden) is

4. New York Stock Exchange listing applications A–3762, A–4549, A–5995, A–6257, A–7151, and company reports, for the facts in this paragraph.

roughly a third of all the domestic copper-mine production of the United States. All these companies have from the first been controlled by interests affiliated with the Guggenheims, who have been the most important single factor in the American Smelting and Refining Company. Of that company we shall now speak.

IV. American Smelting and Refining Company

The American Smelting and Refining Company was incorporated in April, 1899, as a combination primarily of trans-Mississippi lead smelters.[5] The company also owned some mining property in Mexico, from which desirable ores could be obtained.[6] It was an important consolidation and was promoted by various interests, including Lewisohn Brothers, the metal brokers and mine owners, and Henry H. Rogers of the Standard Oil Company, who was also at this time engineering the formation of the Amalgamated. When, early in 1900, the United Metals Selling Company was formed, as a successor to Lewisohn Brothers, and as a selling agent for the output of Amalgamated and allied interests, it was arranged that the Smelting Company should market its copper and silver through the selling company; a relationship which continued until 1908.[7]

Now there had remained outside the combination the important lead- and copper-smelting concern, M. Guggenheim's Sons. Early in 1901 the Smelting Company acquired the property and business of the Guggenheims for $45,200,000 of its stock. Five of the Guggenheims were promptly chosen to the board of directors, — one of them as chairman, — and since then Guggenheim

5. See Comm. and Fin. Chron., lxviii, 821, 975.
6. See New York Stock Exchange listing application A-3601.
7. Comm. and Fin. Chron., lxxvii, 724; A. S. and R. Co., report for 1914; private information.

interests have been dominant, or at least of large influence, in the organization. Among the assets taken over in 1901 were the large copper smelter and refinery at Perth Amboy, New Jersey. Even so, however, the company was still a minor factor in the American copper industry.

Very important in the development of the Smelting Company was the influence of the independent, tho allied, Guggenheim Exploration Company. This was incorporated in June, 1899.[8] Its function was to finance the discovery and/or development of mining properties in the United States and Mexico, acting typically as a holding company for stocks of the companies owning such properties or formed to own them. The importance of the Exploration Company for the Smelting Company lay chiefly in two directions. In the first place, it was the owner of a considerable share of the securities which went to make up the assets of the American Smelters Securities Company when the latter was formed in 1905 as a subsidiary of the Smelting Company (later to be absorbed by the parent organization).[9] Secondly, it was the principal agent in establishing community of interest between certain mining companies, especially those which are now in the Kennecott group, and the two smelting companies; whereby it has come about that the ores and concentrates of the mining companies have been turned over to the American Smelting organization for reduction and for the sale of their metallic content.

8. Copper Handbook, viii, 767.

9. Comm. and Fin. Chron., lxxx, 1237; ci, 529; and private information.

The writer has been informed by an official of the Smelting Company that when the American Smelters Securities Company was first organized, as the American Smelters Exploration Company, it was rather supposed that the Guggenheim Exploration Company would go out of business and that the new company would succeed it in "exploring" for new properties.

Part of the new construction planned when the Securities Company was formed was a copper smelter at Garfield, Utah, to be built by the Garfield Smelting Company, which also owned mining property in Colorado. Now in 1903 the Utah Copper Company had been formed, and in the course of a few years began to operate on a commercial basis on the great hill at Bingham, 17 miles from Garfield. In 1905 Guggenheim interests purchased a block of Utah stock,[1] and Utah Copper concentrates have always gone to Garfield for reduction. The Guggenheim Exploration Company invested in turn in the Utah Copper Company, the Nevada Consolidated, and the Cumberland-Ely (later consolidated with the Nevada). Later, the Hayden-Jackling-MacNeill interests, which officered the Utah and Nevada, organized the Ray and Chino companies to operate in Arizona and New Mexico, respectively. The Chino sent its concentrates to the El Paso smelter of the American Smelting Company. The Ray began to build its own smelter at Hayden, but while it was in process of erection, sold it to the American Smelting Company and made a contract to send its concentrates there to be treated.[2]

In 1904 the Braden Copper Company was organized, to own a large copper deposit at La Junta, in Chile.[3] Virtually from the start the Guggenheims were interested in the property. In 1909 the Braden Copper Mines Company was incorporated as a holding company for the copper company.[4] Shortly afterwards, the great Kennecott mine in Alaska, under Guggenheim control, began to produce and to send its ores and con-

1. Comm. and Fin. Chron., lxxx, 2225.
2. See New York Stock Exchange listing applications A-3933, A-3934; and annual report of the A. S. & R. Co. for 1911.
3. Copper Handbook, xi, 1057.
4. Ibid., 1187.

centrates down to the Smelting Company's plant at Tacoma, Washington. When, in 1915, it was decided to liquidate the Guggenheim Exploration Company, the prosperity of the Kennecott was taken advantage of to turn over to it the Exploration Company's holdings of Utah and also to make it the parent company of the Braden Copper Mines Company, through exchanges of stock.[5] Meanwhile, in 1912, the Chile Exploration Company was organized to operate a great blanket ore deposit at Chuquicamata, Chile. In 1913, the Chile Copper Company was formed, with a stock issue of $95,000,000, all of which (except directors' shares) was delivered to the Exploration Company in exchange for its $1,000,000 stock, certain water-rights, a power location, water springs and salt areas, and about $9,000 in cash.[6] Daniel Guggenheim was made president of the Chile Copper Company, and at least six other Guggenheims have been fellow directors.[7] Copper from all these companies except the Chile was refined (and, except for Nevada and Braden, smelted) by the American Smelting and Refining Company, which sold the copper after refining it, and also sold the output of the Chile Copper Company. Of course, the Smelting Company had meanwhile greatly enlarged its reduction facilities and acquired others, including the plant of the Baltimore Copper Smelting and Rolling Company. In 1917, the year of our entry into the war, the Smelting Company's various plants turned out

5. Letter to Guggenheim Exploration Company stockholders, of November 22, 1915; New York Stock Exchange listing application (Kennecott stock) A–4549. The Exploration Company also owned shares in Ray, Chino, and the American Smelting and Refining Company.

6. New York Stock Exchange listing application A–4507.

7. It will be recalled that the Anaconda Copper Mining Company in 1923 purchased from Guggenheim interests the controlling interest in the Chile Copper Company, buying 2,200,000 shares at $35 a share.

nearly 425,000 tons of copper, 275,000 tons of lead, 26,000 tons of zinc, nearly 2,500,000 ounces of gold and 70,000,000 ounces of silver; and it sold that year one eighth of the world's output of gold, about a fourth of the output of silver, more than a fourth of the copper output, and over a sixth of the lead.[8]

By 1926 the company had ceased to act as selling agent for most of the copper (other than the output of its own mines) which went through its plants; having transferred to Guggenheim Brothers its function as selling agent.[9] It had, however, become an even larger factor than in 1917 in the refinery production of copper and lead, and in 1926 turned out 525,897 tons of copper and 469,607 tons of lead.[1] The American Smelting and Refining Company now owns copper smelters at Maurer and Carteret, New Jersey; El Paso, Texas; Hayden, Arizona; Garfield, Utah; and Tacoma, Washington. Its refineries are at Maurer, Carteret, Baltimore, and Tacoma, the Baltimore refinery having the largest capacity of any in the world, and in addition doing some fabricating of copper. The Smelting Company still owns and leases various mines in the United States, Mexico, and Peru. Some of these produce copper, but largely or wholly as a by-product, lead, silver, gold, and zinc being the principal products of the company's mines. Such fabricating as is done at Baltimore (copper) and at San Francisco (lead) is at plants which were fabricating before the Smelting Company acquired them. In the matter of integration at the other end, it should be mentioned that the company or sub-

8. New York Stock Exchange listing application A–5919 gives the company's figures of production (by weight) and (dollar) sales in the years 1917 to 1921, inclusive.

9. And of course the output of the Chile Copper Company is now disposed of through its parent organization, the Anaconda.

1. Company's annual report for 1926.

sidiaries own coal mines, coking plants, minor transportation facilities, and various other minor properties which need not be mentioned.

The foregoing recital of the development of this organization requires little further comment. It may be summed up, so far as concerns the copper industry, as follows. The American Smelting and Refining Company is primarily a horizontal combination, representing a minor degree of integration. Altho it owns no important copper mines, it is the foremost refiner of copper in the world, and was for years the greatest seller. Affiliations of its dominant interests provided it with the major part of its copper-refining business, through contracts with a handful of the greatest copper mines in the Western Hemisphere. Having established the refining capacity, its primacy is likely to go unchallenged, whatever its financial affiliations in the future. The Smelting Company and the Anaconda are the outstanding organizations in the non-ferrous metal industries of this country and of the world; and the Anaconda and Guggenheim interests between them dispose of between two thirds and three fourths of all the virgin copper that is refined in the United States and South America, and represent a rivalry of which at times the copper market and copper consumers are by no means unaware.

V. Conclusion

The foregoing review of the evolution of industrial organization in the domestic copper industry may be summarized as follows.

1. In each of the great copper camps of the country, productive territory and practically all the output of copper have tended to be consolidated into the hands of one or two large organizations.

2. As a result of these consolidations and of the fact that the number of highly productive copper districts has been relatively small, control of the copper output of the country has for the past forty years been largely concentrated in a few hands.

3. With a few minor exceptions and one major exception, — the Anaconda, — vertical integration has stopped with the refining of copper and its sale to fabricators, and has not gone even as far as this in the case of some of the largest organizations.

4. Integration has been typically upward, but from the beginning a certain percentage of the smelting and refining capacity of the country has been devoted to the reduction and treatment of ores produced by mines affiliated with the interests owning the refineries.

5. Up to the time that the rich Anaconda and Boston and Montana organizations built their own refineries, copper-refining in the United States outside of the Lake was typically a custom operation performed for the producing companies by independent or, at most, affiliated refineries. Even today there are two refineries on New York Harbor, the Nichols and the United States Metals, which do nothing but custom work, not being part of any American copper-producing organizations. Both of these refineries incidentally turn out a large volume of copper from foreign sources.

6. Horizontal combination of mining properties involving more than one camp or district was an exceptional phenomenon prior to 1910, tho, of course, the American Smelting and Refining Company represented a notable horizontal combination of metallurgical plants. Even the Amalgamated Copper Company, as a mine owner, up to 1912 represented to all intents and purposes merely a combination of Butte mining proper-

ties. The outstanding exception was Phelps, Dodge and Company.

7. Even Phelps, Dodge and Company was not incorporated until 1909, so that prior to that date it may be said that the properties under its control were affiliates rather than components of a combination. There have been numerous other instances of affiliated operations such as the Bigelow-Clark-Lewisohn [2] mines in Michigan and at Butte; the properties owned by W. A. Clark in Butte and at Jerome; the Lewisohn companies (not hitherto mentioned) in Tennessee and at Miami, Arizona; and the Jackling-Guggenheim porphyries and Kennecott, before Kennecott became the parent company for the group.

8. While there is no organization integrated through refining which does not sell its own copper (with the exception of the New Cornelia), it is by no means true that the concern that refines copper for a mine always sells it. The mining company may itself sell it or may turn it over to an entirely different organization.[3]

In short, it is practically impossible to generalize about anything regarding industrial organization in the copper industry. There seem to be exceptions to almost every generalization that one tries to lay down. This is true not only of the present situation, but of the development within the industry over the last half-century. For this, doubtless, various factors have been responsible. In the first place, the mining and metallurgical problems at the leading camps have been curiously different. The contrast is not between the Lake district and all others, but almost between each district

2. The Clark in this combination was not W. A. Clark, but Joseph Clark.

3. On the organization of the copper market, the reader is referred to an article by the writer in the Harvard Business Review for January, 1923.

and every other district. This has affected not only the type of physical plant, but the rapidity of growth through the rapidity with which profits were amassed. Not less different than the technical problems have been the personalities. Alexander Agassiz and W. A. Clark; John D. Ryan and the Guggenheims; Cleveland Dodge or James Douglas and Daniel Jackling — it would be impossible to assume that organizations managed by these different men would evolve along the same lines. One thing common to all the big producers, other than the porphyries (which financed their initial development entirely through security issues), has been that they operated on deposits so rich and so quickly profitable, that the owners and managers of the properties could develop them along such lines as they chose; and by virtue of staying in the business of raw-copper production and not diverting their resources to integration into the fabricating stage, all the more liberty of action could be had from the financial resources at hand.

It is characteristic of most branches of the nonferrous metal industries that the producers of the raw metals should not engage in fabrication except of rather simple types. Tonnages are so much smaller than in the iron and steel industry that, apart from other technical factors, this circumstance would make the erection of a fabricating plant, except for some simple product like wire, less attractive or desirable than in the steel industry. The extreme homogeneity of raw copper as compared with the various forms in which lead and zinc come on the market makes the final stage in the production of raw copper much more of a mass-production operation than would be found in most lead or zinc plants. It will be recalled that the one outstanding example of integration through the fabricating stage is that of the outstanding copper producer of the

country buying up the greatest copper consumer in the world, and then only after the Anaconda had become also one of the greatest of zinc producers.[4] Another circumstance to be remembered is that the greater part of the copper produced in this country is refined, not by the organization which dug the copper out of the ground, but by some refining company which is interested primarily in the tolls it receives for refining and not for the most part in buying the copper either for resale or for use in a fabricating plant. All one can say is that this is the way development came about in the copper industry. It could very well have evolved otherwise, but did not.

Up to the end of the nineteenth century, the expansion of the copper companies came primarily through original sales of small amounts of stock, profits, and in some instances later sales of stock chiefly to a small group of insiders. From the closing years of the nineteenth century on, recourse has been had in increasing measure to the public security markets, especially as organizations wanted to grow while profits were increasing, if at all, at a diminishing rate, or where, as in the case of the porphyries, the initial development of mining operations and of plant must be on a large scale. In the nineteenth century the big concerns could and did fight each other because they had the resources, were producing copper at costs well below even low market prices, and wanted still further to reduce costs through larger operations, and to keep their places in the sun. It has been characteristic of more recent years that large production has often been due to necessity rather than to choice or pride; for large security

4. As this article was being put in type, the newspapers announced the purchase by the Anaconda, through a subsidiary, of the Detroit Copper and Brass Company.

issues, and especially large bond issues, have meant the necessity for meeting fixed charges and keeping costs down as far as possible through the economies of large-scale output. The competition of today differs radically from that of the eighteen-eighties and nineties in being much nearer the margin. This fact has probably encouraged the building up of larger and larger organizations. Whether evolution will continue in this direction only time can tell.

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TAWNEY'S RELIGION AND CAPITALISM, AND EIGHTEENTH-CENTURY LIBERALISM

MR. TAWNEY'S book[1] deals with the influence of religious thought in England in the sixteenth and seventeenth centuries upon economic ideals, practices, and institutions. It begins with an account of the economic philosophy of the medieval church, which substantially agrees with such familiar accounts as those of Ashley and of Cunningham. It ends with a very brief description of that new philosophy of encouragement, rather than restraint, of acquisitive ambition and enterprise, which had definitely displaced the medieval outlook by the beginning of the eighteenth century. Intervening chapters describe the slow conversion of the mind of the nation from the medieval to the modern point of view, giving special attention to the evolution and influence of Puritan ideals. The thesis is very similar to that of Max Weber's essay, "Die protestantische Ethik und der Geist des Kapitalismus," to which Mr. Tawney acknowledges his indebtedness. He criticizes Weber, however, for exaggerating the influence of Puritanism, and the simplicity both of Puritanism and of "the spirit of capitalism."[2] Throughout his own treatment, he carefully emphasizes qualifications and complexities; at least, until he reaches the period of the definite emergence of that new philosophy whose genesis he has been tracing. Here it seems possible to suspect some serious oversimplification and onesidedness. It may be best to summarize the argument of the book, before dealing with this possible deficiency.

The medieval church, we are told, tried to impose upon the

1. Richard H. Tawney, *Religion and the Rise of Capitalism*, New York, Longmans, 1926.

2. See his Notes on chap. 4, pp. 315–316, note 32.

population of Europe a moral discipline, which included within its sphere the economic side of life, and restrained the acquisitive desires of individuals, in the interest both of their own spiritual health and of justice and the common welfare. The restrictions were often unwise in their details, and often ineffective; but they embodied a noble and sound ideal, and did mitigate, tho they could not eradicate, the harsher forms of exploitation and oppression. The Reformation, in its earlier stages, brought no abandonment, but rather a more vigorous preaching, of the traditional code of Christian economic ethics. The rising bourgeoisie, however, became increasingly impatient with the restraints imposed by this code. Conditions of the times required some change; and various intellectual currents converged in the seventeenth century to produce a new philosophy. Puritanism in its old age evolved an ethic that sanctified acquisitive ambition, and nearly summed up the Christian's duty in the "economic virtues."

This new gospel not only stimulated industry, thrift, and the accumulation of wealth, but also gradually weakened, and eventually destroyed, the medieval scruples which had restrained the greed of traders in the social interest. The entire liberal, or anti-traditionary and anti-authoritarian movement of the time, which in politics produced modern democracy, had as its outcome in the economic sphere simply the unfettering of capitalists and business men, and an a-moral or non-moral theory of economic relations. Its crowning intellectual achievement was the new economic science, which taught that the business man's actions are inevitable products of a social mechanism whose motions can be scientifically explained, but cannot be criticized. In the atmosphere of such ideas, modern capitalism, or the organization and direction of the nation's economic life by self-seeking members of a rich commercial class, could flower and flourish.

I will not venture to discuss this argument in its entirety. The subject has been too much neglected by English and, especially, by American economists; and a readable yet erudite contribution such as this would be welcome, even if its faults were many. It may be desirable, however, to sug-

gest the possibility of a different interpretation of the liberal movement and of the economist's notion of a social mechanism. To do this, it will be necessary to refer mainly to writers whom Mr. Tawney neglects or ignores; above all, to eighteenth-century writers. These may perhaps be regarded as lying outside of his chosen period; but they are not irrelevant to his thesis. He professes to trace for us the transition from the medieval to the modern attitude toward economic life.[3] His assumption that the essential part of the transition was complete by 1700, and that its outcome is adequately seen in the writings of some late seventeenth-century Puritan divines and pamphleteers, requires to be tested by reference to the writings of other leaders in the wider intellectual movement, not only of the seventeenth century but of the eighteenth as well. Even for his narrower special purpose, of exhibiting the influence of Protestant religious and ethical ideas upon economic theories and arrangements, the views of orthodox Anglican and Puritan clergymen are surely no more relevant than those of Grotius, Locke, Shaftesbury, and Hutcheson. Tho the two last mentioned, like many later philosophers of liberalism, were perhaps not technically Christians, their "natural religion" was hardly a shade different from the liberal Christianity of Locke; and their whole social outlook was probably about as much (or as little) a product of the Reformation, as was the social outlook of the Puritans of an earlier generation.[4] On all accounts it seems permissible, without questioning Mr. Tawney's interpretations of his own chosen materials, to ask whether a wider sur-

3. See his Introduction, paragraph 1, last 3 sentences; and his concluding chapter (5).

4. For the religious and ethical views of Shaftesbury and Hutcheson, and their relations to Locke, and to Adam Smith, see L. Stephen, English Thought in the Eighteenth Century. A good study by an economist, which emphasizes the influence of Shaftesbury upon the eighteenth century in general and Adam Smith in particular, is Hasbach's "Die philosophischen Grundlagen der von F. Quesnay und A. Smith begründeten politischen Ökonomie," in vol. x of Schmoller's Forschungen. An old work, interesting and valuable because of its author's close relation to Adam Smith in time and environment, is Dugald Stewart's "Dissertation" on the history of philosophy since the Renaissance; published as vol. i of Sir W. Hamilton's edition of Stewart's Works.

vey would bear out his conception of the liberal movement as simply a progressive stripping off of legal and moral restraints upon the anti-social greed of individuals.

Medieval restraints upon activities and contracts motivated by acquisitive ambition had originally been formulated in the name of the moral Law of Nature, which prescribes to individuals their duties and sets just limits to their claims. But the liberal protest against these restraints was formulated in the name of that same Law of Nature. And while the morality that was summed up in the Natural Law of Locke and the Physiocrats was not the same morality that was embodied in the Natural Law of Aquinas, one must hesitate to pronounce it a less noble or less generous morality. Aquinas and his contemporaries talked mainly of the *duties* of men; Locke and his successors emphasized their *rights*. Yet it is a commonplace observation that A's right against B is the other aspect of B's duty toward A, and vice versa. If all men did their duties, all would enjoy their rights; if rights are universally respected, certain duties are thereby recognized.

The significant question is, which formulation of the moral law is more conducive in practice to a healthy social situation, and is least easily perverted to the selfish uses of a dominant class. And this is not so easy to determine. A priest who talks to men about their duties seems to be inculcating a high and unselfish morality. A philosopher who talks to them about their rights is accused of flattering selfish interests, and encouraging an anarchistic and immoral individualism. But it is noteworthy that men in positions of power and authority often prefer to talk the language of duties, tho it involves their paying at least lip-service to the idea that they themselves have duties toward their inferiors. This is the language of paternalism. When a submerged class rebels, its leaders generally prefer to talk the language of rights, even if they must recognize, at least in theory, that *all* men have rights and that rights limit one another. This is the language of democracy. Traders in the seventeenth century, and laborers in the nineteenth, claimed new rights, and were rebuked by conservative churchmen and statesmen for cast-

ing aside and denying old duties. Can we conclude, from this alone, in either case, that all of the moral idealism was on the side of conservatism, and all of the selfishness on the side of rebels and innovators?

It is true that seventeenth- and eighteenth-century liberals accorded to the self-regarding desires and ambitions of individual men a measure of moral approval which medieval Christians had denied to them. But it does not follow that they wished to discard all moral restraints that might protect the community against the overweening greed of individuals. The new leniency toward individual desires was closely connected with a new faith in the moral faculties of individuals, and in the goodness of normal human nature. Self-centered desires were trusted to promote the general welfare, because reason and the moral sense were trusted to restrain them wherever their indulgence would be inconsistent with that welfare. Evidence upon this point could be multiplied *ad infinitum*, if there were space. It may suffice for the present purpose to note some important writers whose general positions bear out the assertion.

To begin at the beginning, Grotius once for all founded the whole liberal theory of natural rights upon the doctrine that men are endowed with a disinterested love of society, and a capacity to know and a tendency to do what is right or just toward their neighbors.[5] The British philosopher who most roundly denied this, and asserted the complete selfishness of men, was logical enough to plan a state which, with its absolute power, should ruthlessly curb the lusts of individuals.[6] Once Hobbes had written, every liberal who dared to advocate a measure of *laissez-faire* in any department of life had first to defend the old doctrine of Grotius against Hobbes.[7]

5. Grotius, De Jure Belli ac Pacis, Prolegomena, §§ 5 to 10 inclusive. In W. Whewell's edition, with accompanying translation, pp. xl to xlv.

6. See Leviathan, and any commentary. Croom Robertson's Hobbes, pp. 138–159, is good.

7. This is still true in a measure even of the Physiocrats, a century later. See Quesnay's article on "Droit Naturel," in Oncken's edition of Quesnay's works. While opposing Grotius also on some points, Quesnay plainly has Hobbes in mind as his chief antagonist; and emphatically holds, against him, that natural right is grounded, not in the egoistic

The group of religious philosophers known as the Cambridge Platonists, who were all in the liberal movement, led the attack upon Hobbism, declaring that all men may intuitively recognize the eternal moral truths which bind us to subordinate our own good to the good of mankind.[8] Locke held, with Grotius, that moral axioms are known by an "internal sense"; that from these axioms, the whole moral law may be deduced with a precision approaching that of mathematics; and that thus the Law of Nature was knowable, and binding, even before the establishment of government.[9] Shaftesbury, the father of the school of Scotch moral philosophers that bred Adam Smith, endowed man with an innate "moral sense," and a complete outfit of "benevolent affections"; and taught that self-regarding desires are legitimate, and even virtuous, so long, but only so long, as they are duly controlled and limited by these other propensities.[1] Mandeville revived against Shaftesbury the doctrine of Hobbes, that men are completely selfish; made selfish economic appetites (called vices, in true medieval spirit) the springs of all progress beyond savagery; taught, like Rousseau, that such progress is inseparably connected with many evils, injustices, and forms of misery; and seemed to prefer to have men wisely governed and deceived by autocrats, who should restrain their "vices" partly but not wholly.[2] Francis Hutcheson, disciple of Shaftesbury and teacher of Adam Smith, defended his mas-

calculations of a *non-social* individual, but in (*a*) man's dependence on his fellows, and (*b*) his innate knowledge of moral axioms, both of which show that he was designed for society. And the implication is that, because his nature is social, he can and should be free.

8. The best account of this interesting group is the Rev. J. Tulloch's Rational Theology and Christian Philosophy in England in the Seventeenth Century, vol. ii. For their influence on Shaftesbury, see Leslie Stephen, English Thought in the Eighteenth Century, ii, 23.

9. Sidgwick, Outline of the History of Ethics, pp. 172–175; and Seth, English Philosophers and Schools of Philosophy, p. 112.

1. Stephen, op. cit., ii, 27–32; and Hasbach, op. cit., pp. 103–108. Hasbach makes Shaftesbury's preaching of the natural goodness of man a main source of all eighteenth-century individualism. "Locke had taught that man had a *right* to freedom; Shaftesbury taught that he was *fit* for it." But Locke believed the second doctrine, too. See note 8 above.

2. An excellent commentary on Mandeville is in Höffding, History of Modern Philosophy, i, 400–402.

ter's doctrine against Mandeville, and went so far as to make the pure, disinterested love of mankind the *only* virtuous motive in our natures.[3] Finally, Adam Smith himself, before writing the *Wealth of Nations*, wrote upon our *Moral Sentiments;* and in the earlier book analyzed the mental processes by which we build up out of our experience a knowledge of the moral rules, obedience to which yields conduct conducive to the common welfare; finding in this social beneficence of our moral faculties the same proof of providential design of our natures, which he afterward saw also in the social beneficence of economic (acquisitive) ambition.[4] If the two books are read together, it is clear that Smith agreed with Shaftesbury, that self-centered economic ambition is socially beneficent, *so long as* it is limited, as it normally is, by the beneficent dictates of our moral faculties.

The whole movement, then, for freeing acquisitive enterprise, along with the other activities of individuals, from the old restraints of medieval law and custom, was greatly aided by the faith that, wherever restraints are really necessary in the social interest, they will normally be supplied by a moral sense as native to the individual as his selfish appetites. The function of "positive law" should be the limited one of merely declaring so much of natural law as could be formulated in precise general rules, and could be enforced by the courts

3. Sidgwick, Outline, pp. 195–200; Albee, History of English Utilitarianism, pp. 58–63.

4. The general doctrine of the Moral Sentiments can be appreciated only by one who carefully reads the book through from beginning to end. On the beneficence of our moral faculties, see especially part III, chap. 5. On the relation of Smith's ethical to his economic theories, see Hasbach, op. cit., and G. W. Morrow, The Ethics and Economics of Adam Smith.

Cf. also Professor Jacob Viner's interesting article on "Adam Smith and Laissez Faire," in the Journal of Political Economy for April, 1927. I cannot agree with Professor Viner's opinion that the Moral Sentiments embodies an early, uncritical, enthusiastic outlook which Smith had abandoned before writing the Wealth of Nations; nor with his dictum (p. 210) that "benevolence or sympathy" was made a prominent quality of human nature in the early book, and a negligible quality in the later one. The "sympathy" of the Moral Sentiments is not "benevolence," but is equally the foundation of this, and of the sense of justice, which, as Professor Viner admits (p. 203), always limits the action of self-interest, in both treatises.

against exceptional persons with an abnormally weak moral sense.[5] The objections to the medieval regulations were that they imposed many restraints *not* necessary to the general interest, and often harmful to it; and that much was embodied in inflexible law and custom which was better entrusted to individual consciences.

There was one chief reason for believing that, at least under seventeenth- and eighteenth-century conditions, the surviving medieval rules of conduct and regulations were more often harmful than beneficial to the general interest. Mr. Tawney admits [6] that many of the regulations, such as those of the guilds regarding apprenticeship, quality of work, and prices, either created or fortified monopoly privileges, and were welcomed by the privileged parties partly for this reason; tho they also purported to protect the public against bad work and excessive charges. The prohibition of loans at interest, which in Mr. Tawney's view seems to be about the most important regulation of all, must have had a similar effect. The supply of loan funds had been limited under the medieval law to that furnished by Jews and by Papal agents. These persons were in effect a privileged group, who got a monopoly price for their services; and it surely is not impossible that when the church punished unauthorized usurers with one hand, and itself took interest on a great scale with the other, it was conscious of protecting its monopoly. Mr. Tawney rightly insists that medieval artisans, merchants, and their spiritual advisers be given credit for a degree of sincere moral idealism, even where protection of their own monopoly privileges and gains supplied a part of the motive for adherence to their regulations.[7] Why, then, should not seventeenth-century Puritan business men and *their* spiritual

5. See the numerous passages in the De Jure Belli, in which Grotius distinguishes between the full moral duty of the Christian, and the minimum portion of that duty which is strictly required by Natural Law (here juristically conceived as the ideal or norm of positive law). Also A. Smith's distinction (in the Moral Sentiments) between the rules of justice, exactly definable and hence fit to be written in statute books, and the vaguer rules of prudence and of wise benevolence, which are best left to private discretion.

6. Page 27.

7. Pages 27, 28.

advisers be given credit for an equal degree of idealism, when they sought to throw off regulations; even tho new opportunities of private gain proved to be created by reforms perhaps primarily designed to open new sources of supply of loan funds and of wares? The pamphleteers who urged removal of restrictions upon loans seem generally to have been, not lenders, but borrowing traders, whose cry was for reduction of the interest rate.[8] And certainly it must be clear to careful readers of the Physiocrats and Adam Smith, that *their* belief in *laissez-faire* and free competition was not a belief in the absolute right of individuals to make as much money as possible, regardless of social consequences; but, on the contrary, a belief that the public's right to good service at fair prices could be best protected by universalizing the right to pursuit of the best profits obtainable.[9] They preferred to trust the individual's moral sense, plus his fear of competitors, rather than a law which prescribed the quality of his output and his prices but made him a sheltered monopolist.

The medieval régime of regulated monopolies quite possibly was well suited to medieval conditions. Early modern liberals believed that a régime of free competition would be better suited to the only conditions with which they were familiar; and they may have had too great a tendency to assume its universal superiority. Much depends upon whether we wish merely to preserve an established system of "fair" prices and group standards of living, or to stimulate economic progress, a constant lowering of the real costs of goods, a raising of all standards of living. But the essential point to be made here is merely that a concern for justice and the general welfare may be, and has been, as much the motive and ground of advocacy of one régime as of the other.

I shall not take space to discuss further the general spirit of the liberal movement. Enough has perhaps been said to raise some doubts of the justice of treating it as essentially a glori-

8. See articles in Palgrave's Dictionary of Political Economy on Mun, North, Child, the Culpeppers, etc.

9. See the many strong passages, in the Wealth of Nations, on the monopolistic spirit among merchants and the resulting evils.

fication of private selfishness. But something may be added, in conclusion, about the implications of the economists' conception of economic society as a mechanism, whose processes (made up of human actions) are to be causally explained. The intricate logical problems here involved cannot, of course, be gone into; but a way out of the difficulty of scientifically explaining and morally criticizing the same human actions may be suggested.

By way of approach to this topic, it may be pointed out, that Mr. Tawney's criticism of traditional economic theory is an example of one of two contrasting types of criticism, which get curiously combined and confused in much current controversy. From Carlyle onward, there have been moralists who tended to denounce economists as atheists, materialists, and "mechanistic" fatalists, and to accuse them of teaching that men and societies are mere machines. They are supposed to maintain that all actions, events, and conditions are inevitable; that prices and incomes, in particular, are governed by "inexorable laws"; and that "interference" with these laws, in the interest of justice, is impossible.[1] On the other hand, at least from Auguste Comte onward, there have been persons with a leaning to "naturalistic" or "positivistic" types of philosophy, who have accused these same economists of being antiquated and pious thinkers, theologically or metaphysically minded, who confuse the causal "laws" of modern science with the beneficent ordinances and moral precepts of a deified "Nature."[2] The fullest statement of this second accusation is contained in Thorstein Veblen's well-known essays.[3] Here is a contrast! According to Tawney, the classi-

1. Others of the "English romanticists" besides Carlyle took this line. See an amusing essay by the poet Southey, attacking Malthus, written in 1818, and published in Southey's collected Essays. Ruskin in Unto this Last and Munera Pulveris is more explicit than Carlyle in attacking the supposed inexorability of economic laws.

2. See, for instance, chap. 4 of Ingram's History of Political Economy (Ingram was a disciple of Comte); and Cliffe Leslie's Essay on "The Political Economy of Adam Smith," in his Essays, Moral and Political.

3. Thorstein Veblen, The Place of Science in Modern Civilization, and Other Essays—especially the three connected essays on Preconceptions of Economic Science.

cal economists and their seventeenth- and eighteenth-century predecessors used the ideas of physical science to explain economic actions and events in a way that logically precluded the application to them of ethical criteria. According to Veblen, they used theloogical, metaphysical, and ethical ideas to describe the economic order planned by "Nature," in a way that made objective economic science impossible until this pious structure was demolished. Both interpretations assume a conflict, or at least a hiatus, between moral philosophy and explanatory science as applied to human behavior. The suggestion offered here is that for the founders of economic science no such conflict or hiatus existed; and that when their conception of a social mechanism, and the uses they made of it, are fully understood, they will be seen to have opened a way to causal explanation of economic behavior without abdication of the right of criticizing it or the hope of reforming it.

If competition generally prevails in a community, and the dominant motive of its members in their business activities is the desire to make as much money as they can make honestly, then the best guide to explanation and prediction of the actions of masses and classes of men will be found in the assumption that, other things being equal, they will do, in any given circumstances, whatever promises to be most profitable to them financially. If the effects of a war, a crop failure, a gold discovery, a law, a tax, or any other phenomenon, upon men's opportunities of gain, can be predicted, its effects upon their conduct can be predicted, with a greater or less approach to certainty. Each man's action, in turn, will affect his neighbors' opportunities of gain, and hence his neighbors' actions, in a roughly predictable manner. This is the whole simple secret of the method of economic theory. The business man draws from his partial foresight of the reactions which his customers, competitors, and employees manifest to their opportunities of gain, working rules for the efficient conduct of his own quest of gain. The economist seeks to draw, from a somewhat more complete and accurate foresight of the

reactions of all, working rules for public policy designed to promote large production and just distribution of wealth.

Now, any whole composed of parts so interrelated that, when one part moves, the movements of the other parts can be predicted, is a "mechanism." Hence a society composed of individuals and groups whose opportunities of gain are so interrelated that, when some of them act, the profitable and therefore probable actions of the others can be predicted, is, by analogy, a "mechanism." But tho this analogy points a way to explanation and prediction, it in no way precludes concomitant attempts to criticize, reform, or control economic behavior. Here, as elsewhere, prediction makes possible control. We can often get men to do what we want them to do, by creating situations that will make the desired actions profitable. But that is not all. The *ceteris paribus* phrase that qualifies our fundamental assumption, must never be forgotten. Men do not pursue financial gains only, to the exclusion of other objects of desire. The number, quality, and strength of the non-pecuniary motives that interplay with the desire for gain, and check or modify it, may be indefinitely modified by legal, religious, intellectual, and moral influences. Actions can be induced by making them respectable or honorable or pious, as well as by making them profitable. "Mechanistic" economists have not generally denied this. Their use of "laws" of most-profitable-action to explain prices and other economic phenomena, therefore, does not prove that they ever wished to put economic life outside of the sphere of the moralist.

We may go further. The working rules which individuals use in their pursuit of gain, *can* be regarded as *moral* rules, forming part of a wider system of rules for the wise governance of human behavior. These working rules are rules of "prudence," and prudence is generally conceded to be one of the virtues, albeit one of the humbler ones.[4] Prudence in the *acquisition* of one's income consists in the use of intelligence

4. Smith's picture of the "prudent man" in the Moral Sentiments is famous. It is a prudent *business man* he is depicting; but how different from his pictures of business men in the Wealth of Nations!

and foresight to make it as large as possible, consistently with concurrent practise of the other virtues. Prudence in *spending* an income is a deeper matter, involving in the end about all that the Greeks included under "temperance," or the preservation of a reasonable balance among one's interests, such as may make life most worth living on the whole. Now the Physiocrats and Adam Smith seem to have believed that, if the state will enforce the rules of justice and set all individuals free to observe the rules of prudence as they see them in their private affairs, the nation will secure a larger production, juster distribution, and wiser consumption of wealth, than it would be likely to secure under a régime of paternalistic state regulations. The moral Law of Nature therefore prescribed "the system of natural liberty" as the wisest legal order; and under it, those causal or mechanical "laws of nature," in accordance with which both our economic appetites and our moral sentiments arise and function in society, will generally ensure individual behavior conducive to the general welfare.

I would not be understood as being in complete agreement with either the philosophy of liberalism or the doctrines of the early economists. "The system of natural liberty" is not a clear and complete definition of an eternally wise legal order. The reforms introduced in its name have bred new evils, even tho removing old ones. Mr. Tawney may be right in believing that we need to revive, in our present day, some parts of the medieval philosophy which the seventeenth- and eighteenth-century radicals discarded. But it is not always necessary to castigate the prophets of one religion in order to be open-minded toward those of another. Mr. Tawney has given us another version of the socialist myth, that all capitalists are conscienceless and greedy and that liberals and "bourgeois economists" are their flatterers and apologists. Those dour and grim old seventeenth-century Puritan controversialists often talked in a vein like that of the Hobbists whom they execrated. But one hardly believes, after reading Grotius and Locke and Adam Smith, that their temper was the main temper of the liberal movement. If modern capi-

talism, modern liberalism, and modern civilization in general, are to be regarded as products of a new religion that arose in the seventeenth century, that religion has inculcated humanitarianism as well as "the economic virtues." When some one writes the real history of the liberal movement, from Grotius to J. S. Mill, we may possibly find that its leaders were, in greater measure than we had supposed, the prophets, not of an "acquisitive" but of a "functional" society.

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NOTES AND DISCUSSIONS

CHRISTMAS CLUBS[1]

CHRISTMAS CLUBS, as conducted by banks, are not "clubs" in any long-established sense of that term. They have no officers, hold no meetings, carry on no mutual undertakings. Their "membership" consists simply of those who agree to make deposits in accordance with the simple Christmas club plans. Since they are now very numerous, it may be fairly said that they have added a new meaning to the word "club."

Banks conducting Christmas clubs pay to the members, about December 10, those sums they have deposited during the previous fifty weeks. Some of the banks add interest, others do not. When interest is paid, it is generally less than the usual savings-bank rate. The members are required at the beginning of the fifty-week term to promise to deposit a certain amount each week. It is agreed that nothing is to be returned until the end of the fifty-week term. The making of the deposits by the members and the keeping of accounts by the bank are rendered comparatively simple by the use of coupon books, punch cards, or bank books, with the date and amount already printed in them and requiring only the stamp of the teller for validation. The deposits are frequently as small as 25 cents per week; occasionally they are as great as $20 per week; $1 per week is a popular amount.

The Christmas club is peculiarly American — there are,

1. This account is based on interviews and correspondence with three of the companies that promote Christmas Clubs, interviews and correspondence with bankers, and with officials of bankers' organizations, and on inspection of the coupon books, punch cards, and the like material used for the clubs. I am indebted for corroborative information to Dr. Heinz Luedicke, who has been investigating the movement as representative of an association of German savings banks, with a view to transplanting something of the kind to Germany.

apparently, none in countries other than the United States, except a few in Canada. The Christmas club is a new institution (if it may be spoken of as an "institution"). The Carlisle Trust Co., of Carlisle, Pennsylvania, is generally given credit for having organized, in 1909, the first one. The institution has been growing rapidly, especially during the last eight years. It is now carried on, with minor variations, by about 8,000 banks and branch banks in the United States, located in every state of the Union. So sudden has been its development that adequate reports concerning it are not yet required from banks in most states, and accurate statistics regarding the institution as a whole are consequently not available. It seems reasonably certain that last December Christmas clubs distributed at least $300,000,000 to at least 7,000,000 members. Most estimates place the amount distributed and the number of members at considerably more than this. The Christmas club is primarily urban and flourishes most in industrial communities. At least 65 per cent of them lie in Pennsylvania, New Jersey, New York, and New England. With one exception, every bank on the "loop" in Chicago has one.

So far as the banks are concerned, the Christmas club is an advertising undertaking. Only in exceptional cases does it render a profit, and then it is only a nominal one. In the case of banks paying even one or two per cent interest to Christmas club depositors, the banks almost inevitably incur a direct financial loss. The accounts are so small, the deposits are so numerous, the money is on deposit for such a short period, the cost for supplies and advertising is so great, that in spite of the simple accounting and the non-withdrawal feature for the fifty-week period, most banks can expect no more than to "break even," and then only if they pay no interest.

There is no way to prove that Christmas clubs are valuable advertising features for the banks conducting them. There are strong indications that this is the case, however, especially for banks located in industrial communities. There has been a growing number of bankers who feel that this is true, altho

the banking fraternity as a whole has by no means been altogether converted. There is no question that the wage of the American working man permits of considerable saving. The value of the Christmas club to the bank varies inversely (1) with the extent to which the American wage-earner can be led in other and less expensive ways to be familiar with banking activities, and (2) with his willingness to save on his own initiative. These are two intangible features and must vary widely as between different races, individuals, and communities.

In spite of the intelligence of American wage-earners, of the establishment of banks by unions, of the large savings-banks deposits and other forms of investment by American wage-earners, there is strong evidence for thinking that many wage-earners have as yet almost no knowledge of banking activities and also that many of them are not thrifty. Further, it is frequently the case that the competition between banks in industrial communities for wage-earner patronage will make an institution like the Christmas club, designed to attract wage-earners, of value to the bank conducting it even tho it yields no direct profit, for it draws patrons away from other banks.

The attitude of many thousands of bankers is indicated by the following typical statement: "The Christmas club is for the bank the counterpart of the retail merchant's 'leader line.' It brings new customers into the bank — not once, but nearly fifty times a year. Is it not perfectly natural that these people, when they wish to make an investment, open a checking or savings account, secure a safety-vault box, or send a remittance abroad, should think first of the bank where they carry their Christmas club accounts?"

Many banks point with pride to the considerable number of Christmas club members who, when the funds are delivered in December, use part of them in starting new savings-bank accounts or in adding to old ones. The extent to which members do this varies widely (from almost none to 60 per cent), depending largely on the way in which the funds are distributed and the extent to which the bank explains its

time-deposit facilities to Christmas club members. If the bank simply mails out checks in December and says nothing about more permanent accounts, the results obtained can hardly be as favorable as they are if the bank mails vouchers which require the individual Christmas club member to call for his money, and if the bank has on hand throughout the year an adequate force to explain banking facilities in a tactful way to the club members.

Many bankers still object to Christmas clubs on the ground that they teach people to "save to spend" rather than to "save to invest." This seems to be a baseless argument, however, for it is obvious that the funds going into Christmas clubs would in the main be spent for luxuries in any case, and they probably enable the banker to get the ear of the non-investing individual, so that he can in time give him sound financial advice.

Should American wage-earners become in time exceedingly thrifty, the Christmas club, with its generally small rate of interest or its absence of interest, would of course die from lack of patronage. As long as a large number of American wage-earners are not thrifty, the Christmas club seems to have a place in industrial communities as a means of education and as an advertising project by the banks; it will be valuable as such to the extent that the individual banks make use of the contacts it brings.

The rapid growth of Christmas clubs among banks has been due largely to the several companies organized to give part or all of their attention to promoting the idea and to selling accounting and advertising materials to the banks. These number in all about twenty, of greatly varying size. Most of them sell the supplies outright to the banks, altho the largest of them operates on a commission basis, being paid a percentage of the Christmas club deposits. They have been most effective, not only in advertising the scheme but in designing widely varying devices for making Christmas club deposits simple, and especially in furnishing banks with the necessary advertising material. Christmas clubs must be flamboyantly advertised. They grip the public attention

best during the Christmas period, when the jovial Christmas spirit is "in the air," and when, very likely, the individual finds himself short of the funds he would like to spend and is willing to enter into an agreement that will ensure him adequate funds for the next Christmas. At this period of the year, however, there is much advertising by stores, and if a bank is to get attention for its Christmas club it must use advertising material the cost of which would be prohibitive if designed by itself. This material includes such things as flaming placards placed upon the outside of the bank and in its windows and corridors; brightly colored handbills and blotters; cardboard figures of Santa Claus to hang on Christmas trees; specially designed letters sent to numerous persons in the community, telling of the "smile checks" they will receive the next holiday season if they join the Christmas club, and urging them to "light a Christmas candle every week" by making a deposit. That Christmas clubs have become so popular has been due not only to the value of the scheme itself, but also to the way in which it has thus been systematically promoted.

So much for the Christmas club from the standpoint of the bank. It is one of the indications that banks are recognizing the enormous potential saving power of wage-earners, a saving power that is relatively new. They are modifying somewhat their procedure in order to take advantage of it.

Let us look now at the Christmas club from the standpoint of the individual member. Why does he join, and why does he continue throughout the year? At first sight, it would seem to be a foolish enough procedure. He might put the savings which go to the Christmas club into a time-deposit account which would bear from 3 to 4½ per cent interest, whereas the Christmas club in very many cases pays him no interest, and in many more cases pays him only 1 or 2 per cent, and then frequently only on condition that he continue his payments throughout the year. The interest payment practice of Christmas clubs varies widely. In New York City and state, the majority of the banks, so far as can be learned, pay no interest at all, and the tendency is to

increase this majority. Over the country as a whole, probably a majority of the banks pay interest altho the major portion of them pay less than the regular savings-bank rate. A large minority over the country as a whole pay no interest, and there are indications that the number is increasing. Other apparently unattractive features of the Christmas club are, the inability to withdraw the deposits in less than fifty weeks, the compulsory closing of the account about December 10, and the pledge to pay a certain amount each week. To what then is Christmas club patronage to be attributed? Doubtless to a number of circumstances, several of which may affect the same individual but which are by no means uniform between individuals. Among these are:

(1) Ignorance of banking facilities. The individual desires to accumulate a sum. The Christmas club is the banking activity that is most forcibly brought to his attention, and he makes use of it. The Christmas club itself, by bringing the individual into contact with the bank, will tend to correct this condition, in time.

(2) Christmas enthusiasm. The Christmas club appeal comes at a season when this is rampant and Christmas (fortunately, no doubt) takes little cognizance of exact financial calculations. The Christmas club promises a financial surplus to be used next holiday season; the club itself bears the name "Christmas." That is enough. As one banker puts it, in phrases that are enthusiastic but in this case more exact on that account: "We can talk thrift, poverty, security and the like, to the limit — but along comes a phrase, a slogan — 'Christmas money' — and gets 'em. Gets 'em by the hundreds and the thousands. Gets 'em in a way that thrift or poverty or security and the rest of those bank-advertising by-words can't begin to touch. As far as I can see, it's because 'Christmas money' gets 'em right down where they live. Think over the connotation of that phrase — 'Christmas money.' The Christmas tree — candles, stars, tinsel, gifts all done up in white tissue with red ribbon, children racing up and down, new books, oh, 'n' everything — and that glorious Christmas cheer, that big-hearted, self-satisfied

feeling, that over-flow of good will, that belongs with Christmas."

(3) The power of suggestion through advertising. As already pointed out, Christmas club advertising is very skillfully carried out by companies that wholly or partly specialize in this work.

(4) The power of prospective mass action. The very word "club" suggests that many of one's fellows are going to take the action one is contemplating.

(5) The simplicity of the scheme. With coupon books, punch cards, and so forth, the deposits require as little effort as possible.

(6) The realization on the part of many persons that they cannot, without real or apparent compulsion, withstand the temptation to spend from time to time for unwarranted luxuries. Christmas clubs are by no means exclusively patronized by wage-earners. One of the surprises of this investigation has been the many statements on the part of bank officials that they and the members of their families "signed up" in Christmas clubs because they realized that otherwise the money would be "frittered away." Typical statements are: "My wife hustles down to the bank every Monday morning with her five dollars, altho she never would have saved this if she had not signed up." (Cashier of a New York bank.) "Altho I get no interest, I have my card punched for ten dollars every week, for I know I would squander that much if I did n't." (Assistant cashier of a New York bank.) "My wife is as tickled as a kid with a new pair of boots when she gets her check just before Christmas, for she knows it is as good as found." (President of a Middle Western bank.)

(7) Compulsion. This is really part of the last item, but should be considered separately. The Christmas club member promises to deposit a specified amount each week during the fifty-week period. There is no legal compulsion, but there is a very real compulsion. It consists in suffering the disapprobation of the person in charge of the Christmas club if the pledge is not maintained. This would not seem to be a

serious matter, because the person in charge is frequently only a very subordinate bank official. It acts, however, as a spur to many individuals. The desire to avoid being thought "cheap" is a very general human characteristic, and probably is characteristically American. The fear of a "black look" from an insignificant waiter doubtless accounts for the giving of many "tips" that are not deserved. After giving their pledges to the Christmas club, the vast majority — apparently more than 80 per cent — carry them out in full, even tho they know that next December they would receive back whatever they had deposited, should they fail to carry out their pledge.

Christmas clubs are peculiarly the product of an age and a land in which prosperity has rapidly developed among all classes; in which skillful advertising and "high-power salesmanship" have been contrived to appeal to the instincts and emotions of potential consumers to lead them to use all of their income in purchasing consumable goods; in which a knowledge of banks and banking facilities, while great, is by no means universal. Christmas clubs represent an attempt on the part of banks to offset the emotional appeal of sellers not by opposing it but by converting it to their own use. Christmas clubs undoubtedly promote a more rational spending, altho not the most rational, and they probably are of value in helping the public to understand the banks and the banks to understand the public, and so to be of greater help to each other in the future.

LLOYD M. CROSGRAVE.

NEW YORK.

NEW EVIDENCE ON THE SHIPPING AND IMPORTS OF LONDON, 1601–1602

In view of the paucity of authentic and comprehensive materials for the history of British shipping and foreign trade in the opening years of the seventeenth century, it has seemed worth while to make an analysis of an unusually complete and hitherto unpublished document on the subject. This is a list found in the Public Record Office, London (Exchequer K. R. Port Books, bundle 12, no. 1), bearing the heading, "The names of the Shippes and maisters or Shippers together with the burthen and place from whence they come as they ar entred in the custome house of London in one whole yeare Viz a festo St Michis 1601 ad idem festum 1602." A portion of the list has been lost, and what remains does not, as the title indicates, cover a whole year; but it is complete for a period of nine months, from October, 1601, to June, 1602, inclusive. This is a period sufficiently long to justify one in drawing from it, with caution, some conclusions, not only as to the shipping of the day, but as to the volume and sources of London's import trade in the closing years of the long war with Spain (1585–1604).

The list is a chronological record, giving under each date the arrivals for that day. Each item recorded (there are 714 in the period of nine months) gives the name of the ship, its home port, or port of registry, the volume of its cargo in tons, the name of the master, and the port of origin of the voyage. For example, under "Primo Octob 1601" we find five items, the first being "The St George de Westsamen 16 dol (*doliorum*, tons) Cornelis Claison mr ab ibm," and the fifth, "The Parradice de Skeene 60 dol Hawke Webbis mr ab Norway; under "xxviij Junii 1602" we find six items, the first being "The Amitie de London 120 dol Mighell Hampe mr ab Barbarie," and the sixth, "The Hope de Midd (Middleburgh) 10 dol Giles Peterson mr ab ibm."

The document comprises nine folio sheets, closely written on both sides in a distinct modified Court hand, and only

small portions of a few of the items have been obscured by age and damp. One rarely finds among the Port Books of the period a list covering in this way so long a period of time, and so well preserved.

The information contained in the list is of interest chiefly from two points of view. First, since each item contains the name of the home port of the ship, the list indicates the relative importance of the shipping of different countries in the carrying trade to London. Second, since each item contains the port of origin of the voyage and the tonnage of the cargo conveyed, considerable light is thrown on the comparative importance of the different countries as exporters to London. In short, the list serves as an index to England's foreign trade, as exemplified by London, the greatest of her ports.

The most striking revelation which the document affords is the magnitude of London's trade with France, which surpassed in volume even that with the Netherlands (see especially Table X).

TABLE I. — NUMBER OF SHIPS AND TONNAGE, BY MONTHS

Month	Number of ships	Tons
October, 1601	50	2,657
November, 1601	108	3,683
December, 1601	57	3,361
January, 1602	46	1,547
February, 1602	105	4,440
March, 1602	108	3,762
April, 1602	68	2,725
May, 1602	73	5,056
June, 1602	99	4,819
Total	714	32,050

It will be observed that the list does not include shipping engaged in purely coast-wise trade between English ports, but only the commerce in foreign, or dutiable, commodities. That the coast-wise traffic, such as the Newcastle trade in coals, was very important, is beyond dispute; but this, being a customs list, gives no indication of its volume.

In the period of nine months from October 1, 1601, to June

30, 1602, a total of 714 ships are enumerated as coming into the port of London, bearing cargoes amounting to 32,050 tons. The average cargo of each ship was thus 44.88 tons. Table I (p. 741) shows the number of ships and the total tonnage for each month. May was the largest month, June was second, and February third. The smallest month was January.

The ships were of 94 different home ports, and came from 82 different ports of origin.[1]

It seems reasonable to assume that in the remaining three months of the year, from July to September inclusive, ships and cargoes would have continued to arrive at a rate not inferior to the months recorded. Thus the volume of traffic for an entire year may be computed as at least 952 ships and 42,733 tons of cargo (by taking $\frac{12}{9}$ of 714 and 32,050 respectively). The summer months presumably would have been among the busiest of the year, and one may therefore estimate the year's business of the port of London at approximately 1,000 ships and 45,000 tons of cargo. There is no indication of the value of the cargoes, but a few years later the value of London's total annual imports (from Christmas, 1610, to Christmas, 1611) was estimated at £512,060 5*s* 8*d*.[2] In 1604,

1. One of the principal difficulties in making this analysis has been that of identifying and locating the ports named. This has arisen, in part, from the spelling of the scribe, who, like many of his contemporaries, spelt as the spirit moved him, and depended largely on phonetics. For example, "Phioll" is not immediately recognizable as Fayal, in the Azores, nor is "Sherant" a perfect approximation to Gironde, or "Coras" to Culross, or "Welvis" or "Welbie" to Huelva. Moreover, some of the ports named are very insignificant, or have ceased to exist as ports, and are rarely indicated either in modern or in contemporary maps. A good example is the then thriving port of Campheere on the island of Walcheren; apparently it passed out of existence a few years after this list was made, at any rate, it is not indicated in any of the great seventeenth-century atlases (Blaeu, Bertius, Hexham's Mercator, etc.). The only mention I have been able to find of it is in the text of an English epitome of Ortelius published in 1616, page 41 *verso*. By dint of long searching, every port except a few of the most insignificant has at length been identified and located. Lewes Roberts's "Merchant Mappe of Commerce" (London, 1638) has been of considerable assistance both in this respect and in gaining some idea of the principal commodities of trade.

2. Acts of the Privy Council, 1615–16, pp. 479–481.

Sir Edwin Sandys stated in the House of Commons that the custom and impost collected at London amounted to £110,000 annually, and only £17,000 for all the rest of the kingdom.[3]

I. Nationalities of the Ships

Table II shows the relative proportion of ships of various nationalities which came into London in the nine-month period. English ships easily led, with 15,601 tons of cargo in 207 ships. This was approximately half the tonnage brought into London by ships of all nationalities (32,050 tons), and rather less than one third the total number of ships (714).

The ships of the Netherlands were clearly second in the volume of cargo carried (9,328 tons), and the number of their ships was much larger than the English (360 as compared with 207), but they were much smaller ships. It is interesting

Table II. — Number of Ships and Total Tonnage, with Average per Ship, by Nationalities

Nationality	Number of ships	Tons	Average tonnage
English	207	15,601	75.36
Dutch	360	9,328	25.91
German	40	2,656	66.40
French	42	1,732	41.24
Scottish	32	1,074	33.50
Danish-Norwegian	8	725	90.62
Miscellaneous	25	1,934	77.36
Total	714	32,050	44.88

to note that approximately half of all the ships coming into London were Dutch. They brought in only nine tenths as much cargo as the ships of London (10,493 tons), but in nearly three times as many bottoms (360 as compared with 133).

English and Dutch ships had no serious rivals in this carrying trade. Ships of the German (Hanseatic), French, and Scottish ports lagged far behind, both in volume of tonnage and in number of ships.

3. Commons Journals, vol. i, pp. 218–221.

The comparative size of ships of different nationalities is worthy of note. The average amount of cargo in all ships coming into London was 44.88 tons. English ships were considerably larger than the ordinary, averaging 75.36 tons. Dutch ships, on the other hand, were much smaller, averaging only 25.91 tons, or about one third the size of the English ships. This was due, of course, to the fact that English ships coming into London came from many distant places, while most of the Dutch ships were those built and used only for the short sail across the "Narrow Seas." There are many indications throughout that "the longer the voyage, the larger the ship" was a perfectly valid rule.

The largest ships of all those coming into London were those those of Denmark–Norway, which, altho few in number, maintained an average tonnage of 90.62. These ships were famous for their sturdiness. Lewes Roberts [4] describes them as being, next to English ships, "the strongest built to indure the blasts of the colder climates, and the scorchings of the warmer regions."

The absence of Spanish and Portuguese ships was, of course, due to the existing state of war between England and Spain. For the two exceptions to this rule, see page 752.

A more detailed examination of the shipping of each country reveals the following facts.

A. *English Ships*

(1) Ships of London. — About two thirds of all goods brought to London in English ships (in all, 15,601 tons) was brought in ships of London. In this nine-month period, 133 London ships brought a total of 10,493 tons. The average tonnage of these London ships was about the same as that of English ships generally (78.89 as compared with 75.36). Table III indicates the countries of origin of cargoes brought in by London ships, and their relative importance.

France provided by far the largest amount of merchandise for London ships, 4,676 tons conveyed in 67 bottoms. Next

4. Merchants Mappe of Commerce, p. 155.

in importance in this category were the German (Hanse) ports, which sent 1750 tons in 16 ships. The Levant (including Zante, Cephalonia, Crete, Alexandretta, and Syria) was next, and Russia fourth. Barbary was fifth. The other countries sent much less.

TABLE III. — LONDON SHIPS. TONS OF CARGO, BY COUNTRIES OF ORIGIN

Country	Number of ships	Tons	Average per ship
France	67	4,676	69.79
Germany	16	1,750	109.37
Levant (Zante, Cephalonia, Crete, Alexandretta, Syria)	6	750	125.00
Russia	5	730	146.00
Barbary	7	509	72.71
Italy	3	310	103.33
Netherlands	5	290	58.00
West Indies	2	270	135.00
Spain and Portugal	4	190	47.50
Canaries	1	112	112.00
Denmark-Norway	1	80	80.00
Miscellaneous	16	826	51.62
Total	133	10,493	78.89

For London ships, November, February, and May were the big months, February being the largest of all. January was by far the smallest month.

A notable feature of the London shipping is the considerable number of large ships (100 tons and over) which apparently brought shipments of goods for the great London companies, such as those of Muscovy and the Levant, and the Merchants Adventurers. The Russia fleet of five ships, for example, came in as a unit in October, and included the largest London ship recorded in this list, the Swane (Swan) of London, 200 tons, William Wye, master.

(2) Ships of English ports other than London. — Table IV shows the relative importance of the shipping of each English port in the London trade. Among the ships of other English towns which brought cargoes to London, those of Aldeburgh (Suffolk) were most important. Seventeen ships

of that port brought cargo amounting to 1,999 tons, almost all from Bordeaux and La Rochelle. Aldeburgh was at this time a place of considerable commercial importance, but frequent disastrous incursions of the sea in the eighteenth century reduced it to a mere fishing village.

Of the six Hull ships which came to London, four brought cargoes of 30 tons each, but two larger ships raised their average to 53.33 tons; of these six ships, three came from Rouen.

TABLE IV. — ENGLISH SHIPS, WITH TOTAL TONNAGE AND AVERAGE PER SHIP, BY PORTS

Port	Number of ships	Tons	Average per ship
London	133	10,493	78.89
Aldeburgh (Albrow, Albroughe)	17	1,999	117.58
Dover	16	369	23.00
Hull	6	320	53.33
Newcastle	4	310	77.50
Colchester	5	303	60.60
Ipswich	4	296	74.00
Rye (Rie)	3	275	91.66
Orford	2	236	118.00
Plymouth (Plimoth)	2	207	103.50
Lynn (Linne, Lynne)	3	185	61.66
Lee	2	172	86.00
Saltash	1	150	150.00
Sandwich	1	50	50.00
Portsmouth (Portismoth)	1	48	48.00
Dunwich	1	43	43.00
Shoreham (Shoram)	1	40	40.00
Southampton	1	30	30.00
Falmouth	1	30	30.00
Hastings (Hasto)	1	18	18.00
Weymouth	1	15	15.00
Margate	1	12	12.00
Total	207	15,601	75.36

France provided by far the largest amount of cargo, not only for London ships, but for ships of the east coast ports, Aldeburgh, Orford, Ipswich, and the rest, almost all of which brought cargoes from Bordeaux or La Rochelle. Dover ships took to London cargoes almost exclusively from the ports

along the northern coast of France, from Calais to Rouen. Ports of the south coast of England, notably Rye, Sandwich, Lee-on-the-Solent, and Southampton, found a London market for cargoes loaded at Bordeaux and the Gironde (Sherant). A ship of Plymouth maintained the reputation of that port as the starting-point for long voyages by returning to London from Zante and Cephalonia.

B. *Dutch Ships*

By far the greatest part of the Dutch shipping to London was carried by the ships of Flushing. This port, like Brill, was one of the "cautionary towns" held by the English as security for repayment of loans to the United Provinces in their long struggle against Spain. Most of the Flushing ships car-

TABLE V. — DUTCH SHIPS, THEIR HOME PORTS AND CARGOES TO LONDON

Port	Number of ships	Tons	Average per ship
Flushing	149	2,990	20.06
Amsterdam (Amsterdampe)	34	1,400	41.17
Hindelopen (Hinlopen)	7	930	132.85
Campheere (Camphire)	74	687	9.28
Enkhuizen (Ancuson, Ancasen)	12	680	56.66
Dort	19	664	34.94
Middleburgh (Middlebrow, Midelbrow)	24	644	26.87
Memdenblik (Memblick)	2	280	140.00
Rotterdam	6	168	28.00
Terschelling (Terskelling)	1	150	150.00
Meneckdam	1	120	120.00
Zierikzee (Serricksea, Serrickson)	12	104	8.66
Brill	6	100	16.66
Delft	1	88	88.00
Harlingen (Harling)	2	86	43.00
Westschouwen (Westsamen)	6	84	14.00
Harderwyk (Handerwick)	1	60	60.00
Ackersloot (Akerslot)	1	50	50.00
Ameland	1	40	40.00
Sluys (Sluce)	1	3	3.00
Total	360	9,328	25.91

ried cargoes of about 16 tons, and engaged only in cross-Channel voyages; but some of the larger ships brought cargoes to London, not from Flushing, but from Bayonne, the Canaries, Rouen, and Danzig. Bayonne and the Canaries doubtless provided Spanish commodities which the Dutch, like the English, were prevented by war from obtaining in Spain.

Almost all the Dutch ships carried cargoes to London from their home ports exclusively, but there were some exceptions, such as the larger Flushing ships just mentioned, and the large ships (133 tons average) of Hindelopen, which found most of their cargoes in Norway, and some in Danzig and Elbing.

Small ships, averaging only 25.91 tons, were the rule in the Dutch cross-Channel traffic.

Amsterdam ships were next after those of Flushing in volume of cargoes to London (1,400 tons as compared with 2,990); but next after Flushing in number of ships, or, rather, boats, was the little town of Campheere on the island of Walcheren, which sent 74 boats as compared with Flushing's 149; but the boats of Campheere were extraordinarily small, averaging only 9.28 tons. Smallest of all were the boats of Zierikzee, with cargoes averaging only 8.66 tons.

Compared with these tiny boats of Zeeland, which plied only across the "Narrow Seas," those of the towns on the Zuyder Zee, which had a longer sail to make, seem large. Those of Memdenblik averaged 140 tons, those of Hindelopen 133, those of Enkhuizen 56.66, those of Harlingen 43, and those of Amsterdam 41.17. One ship of Hindelopen, the Long wagen, 230 tons, Brower Simoneson, master, is the largest noted in this entire manuscript. It brought a cargo from Danzig.

The ships of Amsterdam almost all brought a uniform cargo of 40 tons. Those of Dort were for the most part of this size, also. It is worthy of note that no Dort ships found their way to London in December, January, or February, presumably because of ice. As many of them came in March as in any other two months.

C. *German (Hanse) Ships*

The Hanse towns profited greatly by sending their ships to carry on the interrupted traffic between Spain and England. Hamburgh and Lubeck, especially, took a large part in this traffic.

TABLE VI. — GERMAN SHIPS, THEIR HOME PORTS AND CARGOES TO LONDON

Port	Number of ships	Tons	Average per ship
Emden	21	1,298	61.81
Hamburgh (Hambrow, Hambrough, Hambroughe, Hambro)	13	868	66.77
Danzig (Dansick, Dansk)	3	250	83.33
Lubeck	3	240	80.00
Total	40	2,656	66.40

Emden was the exception to this rule. Altho her ships brought almost as many tons of cargo to London (1,298) as those of Danzig, Lubeck, and Hamburgh combined (1,358), the Emdeners' cargoes were brought not from Spain primarily, but from Emden, the Scheldt, and elsewhere.

TABLE VII. — FRENCH SHIPS, THEIR HOME PORTS AND CARGOES TO LONDON (See page 750)

Port	Number of ships	Tons	Average per ship
Roscoff (Rescow, Reskow)	4	370	92.50
Sables d'Olonne (Ollona)	6	257	42.83
Dieppe (Deepe)	8	221	27.62
St. Malo (St. Mallowes)	3	168	56.00
Calais (Callis)	2	136	68.00
Fécamp (Feckam)	2	110	55.00
Havre (Newhaven)	5	110	22.00
Quilleboeuf (Kilbeefe)	2	50	25.00
Nantes (Nawnce)	1	45	45.00
Morbihan (Morbeane)	1	45	45.00
Isle d'Oléron (Olderon)	1	40	40.00
Bordeaux (Burdes)	1	40	40.00
Caen (Cane)	2	40	20.00
Conquest (Conquet, Conquett)	2	36	18.00
Marennes (Maren)	1	34	34.00
St. Valery (St. Valeres)	1	30	30.00
Total	42	1,732	41.24

D. *French Ships*

French shipping was of slight importance, as compared with that of England and the Netherlands, and considerably less (1,732 tons as compared with 2,656) than that of the Hanse towns. By far the greater part of England's trade with France was carried in English ships, not in French. The French, however, neutrals since 1598, were using such ships as they had largely in the profitable carrying trade between Spain and England. Especially was this true of the ships of Calais, St. Valery, Fécamp, St. Malo, Roscoff, Conquest, Nantes, Morbihan, Olonne, and Oléron.

The largest French tonnage came from the little Brittany port of Roscoff, which seems to have made a specialty of carrying, in rather large ships (92.50 tons), cargoes to London from Spain and the Canaries. Next in tonnage of the French ports came Les Sables d'Olonne.

E. *Scottish Ships*

The ships of Scotland were notoriously small.[5] Those coming to London (32 ships, with total cargo of 1,074 tons) averaged only 33.50 tons each. They were thus considerably less than half the size of the English ships which came into

TABLE VIII. — SCOTTISH SHIPS, WITH TOTAL TONNAGE, AND AVERAGE PER SHIP, BY PORTS

Port	Number of ships	Tons	Average per ship
Leith (Leeth)	8	367	45.87
Preston (Prestone)	11	243	22.09
Dundee	2	200	100.00
Culross (Coras)	3	80	26.66
St. Andrews	1	60	60.00
Kirkaldy (Kirkadie)	3	58	19.33
Kinghorn (Kinghorne)	2	46	23.00
Queensferry (Queenefarrie)	1	20	20.00
Pittenweem	1	...	...
Total	32	1,074	33.50

5. In a debate in the House of Commons in 1607, a speaker (Mr. Fuller) declared that Scottish merchants were able to undersell English merchants abroad because they carried their wares in small vessels and had not the expense which English merchants incurred in furnishing their larger ships. The Scots, he explained somewhat contemptuously,

London (75.36 tons). Nor was this only because the English ships were engaged in longer voyages, for some of the largest Scottish ships (about 100 tons) found their cargoes in ports as far distant as Cadiz and Bordeaux. These larger ships profited by the fact that Scotland was neutral in the war between England and Spain, and the Scots had an excellent opportunity to convey to England Spanish commodities which were in demand there.[6]

The ports of Preston, Queensferry, Kinghorn, Kirkaldy, and Culross sent their little ships direct to London, while the larger ships of Leith, St. Andrews, and Dundee took their lading for London in France or Spain. In tons of cargo brought to London, the ships of Leith were first, with those of Preston second, and Dundee third.

F. *Ships of Denmark-Norway*

The Norwegian ships brought cargoes only from Norway, and those of the Danish ports, Copenhagen and Tonningen, only from Denmark, with the single exception of one ship

TABLE IX. — SHIPS OF DENMARK-NORWAY, THEIR HOME PORTS AND CARGOES TO LONDON

Port	Number of ships	Tons	Average per ship
Skeene and Norway	5	410	82.00
Copenhagen (Copeman haven)	2	215	107.50
Tonningen (Tunning)	1	100	100.00
Total	8	725	90.62

which profited by the neutrality of Denmark to bring a cargo to London from Spain.

No Norwegian ships came to London between October and May, presumably because of ice.

were accustomed to "carry their Wares in other Countries up and down in Packs." By this small peddling, they were said to have taken all the trade of Dieppe away from the English (Commons Journals, vol. i, p. 335.)

6. See Keith, Theodora, Commercial Relations of England and Scotland, 1603–1707, p. 7.

G. *Spanish Ships*

Only two Spanish ships are listed as coming into London, one of Burela (Barvilla) in Galicia, 60 tons, and the other of Villa Nova (Novilla) in Portugal, 50 tons. Both came from Malaga. These ships may have been brought in forcibly, or they may have belonged to English merchants and thus been admitted.

II. Source and Nature of the Imports

Table X indicates the relative importance of the various countries as sources of London's imports. France stands at the head of the list, with 9,110 tons. Her only serious rival is

Table X. — Imports at London. By Countries of Origin

Country	Number of ships	Tons
France	151	9,110
Netherlands	343	8,391
Germany	40	3,638
Spain-Portugal	42	2,812
Denmark-Norway	22	1,941
Levant (Zante, Cephalonia, Candia, Alexandretta, Syria)	10	1,300
Russia	6	850
Scotland	30	725
Italy	6	570
England	10	532
Barbary	7	509
Canaries	4	422
Miscellaneous	43	1,250
Total	714	32,050

the Netherlands, with 8,391 tons. Germany, the next in importance, provides only 3,638 tons, and Spain still less. Denmark-Norway and the Levant are the only others which attain to more than 1,000 tons.

A. *Imports from France*

France, especially southwestern France, was the greatest source of London's imports. More goods were shipped to London from Bordeaux than from any other port (4,233

tons). La Rochelle was second among the ports of France (1,549 tons); then came Rouen (991 tons). The Gironde, Calais, and Bayonne followed in the order named.

The ports of the northern coast of France provided a total of only 1,995 tons, as compared with 6,935 tons from the ports of southwestern France. This striking preponderance of Bordeaux, La Rochelle, the Gironde, and Bayonne was no doubt due in some measure to the fact that, while a state of war prevailed between England and Spain, many Spanish commodities were carried into southwestern France and there sold to English merchants.

TABLE XI. — IMPORTS FROM FRANCE

Port	Number of ships	Tons
Bordeaux (Burdes, Burddo, Bardes)	42	4,233
La Rochelle (Rochell)	16	1,549
Rouen (Roane)	33	991
Gironde (Sherant)	6	753
Calais (Callis, Callice, Calles)	25	576
Bayonne (Baion)	6	400
Dieppe (Deepe)	11	215
Marseilles (Marcelles)	1	150
Caen (Cane)	4	103
Fécamp (Feckam)	2	40
St. Malo (St. Mallowes)	2	30
Toulon (Tallowne)	1	30
St. Valery (St. Valeris)	1	25
Havre (Newhaven)	1	15
Total	151	9,110

The trade with France was carried on almost entirely in English ships. Not only did the ships of London find their principal cargoes in France (see Table III), but almost all the coast towns of England, which sent a ship or two a year to London, brought cargoes from France. The ships in this French trade averaged two and one-half times the size of those in the trade with the Netherlands (60.33 tons as compared with 24.46). Moreover, these were almost exclusively English ships, whereas the Dutch trade was almost entirely

in Dutch ships.[7] This thriving trade was carried on in spite of a fierce rivalry between English and French seamen and merchants, which produced an era of depredations and confiscations.[8]

The principal imports from northern France were linen cloth, paper, soap, and the like, in exchange for English woolen cloth. From Bordeaux and La Rochelle came wine, salt, woad, oils, and the like, in exchange for money, fish, hides, and so forth.

B. *Imports from the Netherlands*

Flushing was easily first in volume of exports to London, with Amsterdam second. In the number of ships sent to Lon-

TABLE XII. — IMPORTS FROM THE NETHERLANDS

Port	Number of ships	Tons
Flushing	143	2,480
Amsterdam	33	1,310
The Scheldt (Le Sca)	9	900
Middleburgh (Middelbrow)	26	753
Dort	19	664
Campheere (Camphire)	65	661
Enkhuizen (Ancuson)	10	450
Memdenblik (Memblick)	2	280
Brill	7	180
Rotterdam	5	158
Terschelling (Tirskelling)	1	150
Zierikzee (Serricksea)	12	104
Delft (Delphe)	1	88
Harlingen (Harling)	2	86
Westschouwen (Westsamen)	6	84
Ameland	1	40
Sluys (Sluce)	1	3
Total	343	8,391

7. The importance of the French trade to English shipping is emphasized in a manuscript dated 1604, preserved in the British Museum (Stowe MSS, vol. CXXXII, ff. 148–151). This contains the assertion that more English ships were maintained by the French trade than by that with any other country.

8. For the story of this bitter controversy, see P. Laffleur de Kermaingant, Mission de Jean de Thumery, Sieur de Boissise, 1598–1602, passim.

don, Campheere was second only to Flushing, but their small size (only 10.17 tons) prevented this traffic from bulking large in tonnage. Practically all this trade was carried in Dutch ships. Only rarely does an English ship creep in.

The Scheldt is, of course, in a category by itself. Altho Antwerp, and indeed all the other ports of the Spanish Netherlands, were closed by war to Dutch and English traders, and such commerce as issued from the Scheldt was borne by German ships, chiefly of Emden, it appears that English ships occasionally succeeded in obtaining a cargo at the mouth of the river.

John Wheeler, secretary of the Merchants Adventurers, mentions as among the principal exports from the Netherlands to England Rhenish wines, metals and metal wares, linen cloth of all sorts, tapestries, and gunpowder. The principal English exports to that region were woolen cloth both white and colored, lead, tin, leather, tallow, beer, and the like.[9]

C. *Imports from Germany*

Danzig ranked first in volume of exports to London, with Stade second and Elbing third. All the ships that came from Stade were London ships, probably the property of the Merchants Adventurers, who at times had their staple there. From Elbing, also, most of the ships were of London. But from Danzig, on the other hand, almost all the cargoes were brought in Dutch ships. All these ships were large, averaging over 100 tons. This trade apparently suffered in the winter because of ice; no ships came through in January or February; indeed, no Danzig ship appeared in London between October and April.

Emden was in a separate category. Not only were the ships to London from that port neither English nor Dutch, but native, but they were also much smaller, about one third the size of the big Dutch and English ships in the trade with Stade and the eastern Hanse towns.

9. A Treatise of Commerce (London, 1601), pp. 22, 23.

TABLE XIII. — IMPORTS FROM GERMANY

Port	Number of ships	Tons
Danzig (Dansk, Dansicke)	10	1,220
Stade (Stoad)	8	960
Elbing (Elbinge)	9	950
Emden	12	468
Hamburgh (Hambrow)	1	40
Total	40	3,638

Germany's principal exports to England were metals, wine, timber and ship's stores, in return for woolen cloth, lead, tin, and the like.

D. *Imports from Spain and Portugal*

The volume of imports from Spain was approximately equal to that from the Hanse towns. San Lucar and Malaga were the principal ports of origin, and in these the Germans and French shippers got their cargoes. At Cadiz, the next in order of importance, they shared the traffic with the Scotch.

TABLE XIV. — IMPORTS FROM SPAIN AND PORTUGAL

Port	Number of ships	Tons
San Lucar (Selux)	11	965
Malaga (Mallega, Malliga)	14	938
Cadiz (Cales)	7	465
Huelva (Welvis, Welbie)	3	140
Gibraltar (Gibralter)	1	100
Galicia (Gallizea, Galezea, Gallico)	3	88
St. Marie Port	1	60
Lepe (Lepo)	1	38
The Groine	1	18
Total	42	2,812

This trade was, of course, closed to the Dutch as well as to the English, both being at war with Spain. Nevertheless, an occasional English ship was so bold as to put in at Huelva, St. Marie Port, or Galicia, in spite of the state of war. Indeed, one must recognize that in those days the line between peace and war was by no means so sharply drawn as now.

England's principal imports from Spain and Portugal were wine, sugar, oils, wool, fruits and nuts, leather, horses, and East India goods, in exchange for fish, lead, tin, hides, bays, says, and serges.

E. *Imports from Denmark-Norway*

Norway was by far the more important of these two areas, providing nearly four times the volume of imports which came from the Danish ports (1,506 tons as compared with

TABLE XV. — IMPORTS FROM DENMARK-NORWAY

Port	Number of ships	Tons
Norway and Skeene	17	1,506
Copenhagen (Copman haven)	1	100
Elsinore	1	100
Fanö (Phano, Pharno, Pharao)	3	235
Total	22	1,941

435). The Norwegian imports into London were carried largely in Dutch ships, and in a few Norwegian, English, and German ships. No London ship is found engaged in this traffic. The Danish cargoes were carried to London in Danish and English ships. The principal commodities exported to London were fish, tallow, hides, ship's stores, and so forth.

F. *Imports from the Levant*

These were brought entirely in English ships, principally of London, with one from Plymouth and one from Aldeburgh. The commodities imported included spices, drugs, silks, gems, cotton and cotton yarn, sugar, wine, and fruits.

TABLE XVI. — IMPORTS FROM THE LEVANT

Port	Number of ships	Tons
Zante (Zanta)	5	660
Alexandretta (Allexandretta, Scanderone)	2	240
Cephalonia (Zephulonia)	1	150
Syria (Seria)	1	130
Crete (Candie)	1	120
Total	10	1,300

G. *Imports from Russia*

Russia's contribution was conveyed in six large London ships, probably the property of the Muscovy Company. Five of them came as a fleet in October, the sixth in November. Furs, flax, hemp, hides, tallow and ship's stores were the principal imports.

H. *Imports from Scotland*

Preston was the most important port of origin for Scottish exports to London, with Culross second. The goods were conveyed almost entirely by Scottish ships, with a few English ships of east coast ports. Coarse cloths, fish, hides, and metals were the chief commodities of trade.

TABLE XVII. — IMPORTS FROM SCOTTISH PORTS

Port	Number of ships	Tons
Preston	14	326
Culross (Coras, Corras)	9	243
Leith (Leeth)	4	92
Kirkaldy (Kirkadie)	2	36
Kinghorn (Kinghorne)	1	28
Total	30	725

I. *Imports from Italy*

Italian imports to London were brought in ships of London and the East Coast towns. Doubtless a great deal of England's Mediterranean trade came also to Bristol.

TABLE XVIII. — IMPORTS FROM ITALY

Port	Number of ships	Tons
Leghorn (Legorne)	3	310
Venice	2	200
Civita Vecchia	1	60
Total	6	570

The principal imports were silks, velvets, satins, alum, glass, wine, oils, gloves, and marble. In return, England sent lead, tin, bays, says, fish, and hides. Also spices and other East India commodities, which English merchants had once been accustomed to purchase in Italy.

J. *Imports brought to London from other English Ports*

These were apparently foreign commodities, which for some reason had been landed at English ports and bonded, and later sent to on London, where they first passed the cus-

TABLE XIX. — IMPORTS BROUGHT TO LONDON FROM OTHER ENGLISH PORTS

Port	Number of ships	Tons
Queensborough (Quinsborow)	5	440
Colchester	1	30
Dover	1	30
Portsmouth	1	20
Lee	1	12
Scilly Isles (Selly in the West)	1	..
Total	10	532

toms. They were invariably brought in English ships, principally of the East Coast ports. Queensborough enjoyed an advantageous situation for such transshipment.

K. *Imports from Barbary*

The African trade was carried entirely by ships of London. The principal imports were horses, wax, hides, leather, coral, sponges, fruits, nuts, soap, and according to Lewes Roberts,[1] "piraticall Rascalls."

L. *Imports from the Canaries*

French, Dutch, and English ships all had a share in this trade. Shut off in large measure from trade with Spain, the English and Dutch traded with her islands, apparently with slight molestation. Sugar, marmalade, birds, wine, and woad were the principal imports.

M. *Unclassified Imports*

Among the numerous items too small for separate classification, which go to make up the total of London's imports, are several relating to trade with the more distant island possessions of Spain and Portugal, united since 1580 into a single

1. Merchants Mappe of Commerce, p. 70.

empire. These serve to emphasize the fact that, altho England and Spain were at war in European waters, trade was still possible in more distant areas, more especially "beyond the line." Either that, or the English ships which reported cargoes from these areas had obtained them by force.

For example, five ships, all English, brought cargoes from the Azores. One, a ship of London of 70 tons, came from Fayal (Phioll), the others from St. Michael's (St. Mighells). And two ships, both of London, came from the West Indies, with cargoes aggregating 270 tons.

Table XX indicates what proportion of the carrying trade

TABLE XX. — SPANISH CARGOES BROUGHT TO LONDON BY NEUTRAL SHIPS

Country	Number of ships	Tons	Average per ship
Germany	15	1,128	75.20
France	15	869	57.93
Scotland	3	300	100.00
Denmark	1	100	100.00
Total	34	2,397	70.50

from Spain to England fell to the lot of each of the neutral countries concerned. The Hanse towns were the greatest gainers, with France second, and the Scots a distant third.

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BOOKS RECEIVED

Berl, Oskar. Die Chinesische Mauer. Osterreichische Betrachtungen zur Absperrungspolitik der Nachfolgestaaten. Wien: Selbstverlang des Verfassers. 1923. pp. 63.

Brown, Frederick. A Tabular Guide to the Foreign Trade Statistics of Twenty-one Principal Countries. London and Cambridge Economic Service. Nov. 1926. pp. 33. (Special Memorandum No. 21. Published by the service in coöperation with the Harvard Committee on Economic Research.)

Brumbaugh, Martin Allen. Direct Method of Determining Cyclical Fluctuations of Economic Data. New York: Prentice-Hall, Inc. 1926. pp. 73. $1.25.

Cornelissen, Christian. Traité Général de Science Economique. Tome I, Théorie de la Valeur. Tome II, Théorie du Salaire. Tome III, (in two parts) Théorie du capital et du Profit. (Vol. I first published in 1902, is a second revised edition. Vols. II and III appeared in 1926.)

Cox, Jacob D., Jr. The Economic Basis of Fair Wages. New York: Ronald Press Co. 1926. pp. 139. $3.50.

Goodliffe, Walter. Credit and Currency. London: P. S. King & Son. 1927. 178 pp. 8*s*. 6*d*.

Gunn, J. Alexander. Livelihood. Papers in the study of the economic factor for social science students. Melbourne: Robertson & Mullens. 1927. pp. 232. 10*s*. 6*d*. (Being Part two of "Human Society.")

Helfferich, Karl. Money (2 Vols.) London: Ernest Benn. 52*s*. 6*d*. (Translated from the German by Louis Infield. Edited with an introduction by T. E. Gregory.)

Hobson, J. A. The Conditions of Industrial Peace. New York: Macmillan Co. 1927. pp. 123.

Janes, Milton. Man and Society. Menasha, Wis. Banta Publ. Co. 1927. pp. 105. $1.25.

Jordan, E. Forms of Individuality. Indianapolis. Charles W. Laut & Co. 1927. pp. 469. $3.75.

La Dame, Mary. Securing Employment for the Handicapped. A study of placement agencies for this group in New York City. New York: Welfare Council. 1927. pp. 133.

Laidler, Harry W. History of Socialist Thought. New York: Thomas Y. Crowell Co. 1927. pp. 713. $3.50. (Crowell's Social Science Series.

Langeluttig, Albert. The Department of Justice of the United States. Baltimore: Johns Hopkins Press. 1927. pp. 318. $3.00. (Institute for Government Research. Studies in Administration.)

Long, W. Rodney. Railways of South America. Part II: Bolivia, Colombia, Ecuador, Guianas, Paraguay, Peru, Uruguay and Venezuela. Washington: Department of Commerce. 1927. 85 cts. (The 4th volume, on Railways in Latin-American countries, in the Trade Promotion Series. A fifth volume is to come.)

Lundquist, Gustav A. and Carver, Thomas Nixon. Principles of Rural Sociology. Boston: Ginn & Co. 1927. pp. 484. $2.84.

McCombs, Carl E. City Health Administration. New York: Macmillan. 1927. pp. 524. $5.50. (Part I. Municipal Health Functions. Part II. Preventive Functions. Part III. Sickness Treatment Functions.)

McKerrow, J. C. Economics for Nicodemus. New York: Longmans, Green & Co. 1927. pp. 59. $.80.

Marriott, John A. R. The Mechanism of the Modern State. A Treatise on the Science and Art of Government. New York: Oxford University Press American Branch. 1927. Vol. I, 596, Vol. II, 593. $15.00.

Muller, Oscar R. La repartition geographique du commerce extérieur des états-unis et la balance federal des comptes. Paris: Librairie Général de Droit et de Jurisprudence. 1927. pp. 267.

National Industrial Conference Board. The Cost of Living in Foreign Countries. New York: The Board. 1897. pp. 402. $3.50.

——. The Fiscal Problem in Delaware. New York: The Board. 1927. pp. 150. $2.50.

Nogaro, Bertrand. Modern Monetary Systems. London: P. S. King & Sons. 1927. pp. 236. 15*s*. (Translated from the French.)

Oppikofer, Hans. Das Unternehmensrecht in geschichtlicher, vergleichender und rechtspolitischer Betrachtung. Tübingen. J. C. B. Mohr (Paul Siebeck). 1927. pp. 148.

Patterson, Edwin Wilhite. The Insurance Commissioner. Cambridge: Harvard University Press. 1927. pp. 589. $6.00. (Harvard Studies in Administrative Law, 1.)

Powell, Fred Wilbur. The Bureau of Animal Industry. Its history, activities, and organization. Baltimore. Johns Hopkins Press. 1927. pp. 190. $1.50. (Institute for Government research.)

Ripley, William Z. Main Street and Wall Street. London. Brentano's 1927. pp. 359. 15*s*. (English edition.)

Ryan, John A. Distributive Justice. New York. Macmillan Co. 1927. pp. 404. $4.00. (New edition, revised.)

Sack, A. N. Les effets des transformations des états sur leurs dettes publiques et autres obligations financières. Paris: Recueil Sirey. 1927. pp. 599. 80 *fr*.

Sarkar, Benoy Kumar. Economic Development. Snapshots of world-movements in commerce, economic legislation, industrialism, and technical education. Madras: B. G. Paul & Co. 1926. pp. 428. 12*s*. 6*d*.

Smith, Darrell Hevenor. The Panama Canal. Its history, activities, and organization. Baltimore: Johns Hopkins Press. 1927. pp. 413. $2.50.

Snyder, Carl. Business Cycles and Business Measurements. Studies in Quantitative Economics. New York: Macmillan Co. 1927. pp. 326.

Sombart, Werner. Das Wirtschaftsleben im Zeitalter des Hochkapitalismus, III. 2. München: Duncker & Humblot. 1927. pp. 514. *M*. 14.50. (Conclusion of the notable work.)

Sorokin, Pitirim. Social Mobility. New York: Harper & Bros. 1927. pp. 559.

Thomas, Edgar. The Economics of Small Holdings. Cambridge: University Press. 1927. pp. 132. 4*s*. 6*d*.

Tschajanow, Alexander. Die Lehre von der bäuerlichen Wirtschaft. Berlin: Paul Parey. 1923. pp. 132. (Translated from the Russian.)

Tupling, G. H. The Economic History of Rossendale. London: Longmans, Green & Co. 1927. 21*s*.

Tyrrell, G. W. The Principles of Petrology. New York: E. P. Dutton & Co. 1927. pp. 349. $3.25.

Villa, G. Sanin. Desvalorizacion de la Moneda. Medellin, Colombia, S. A. pp. 114.

Webb, Sidney & Beatrice. English Local Government: English Poor Law History: Part I. The Old Poor Law. New York: Longmans, Green & Co. 1927. pp. 447. $8.50.

Willoughby, W. F. The Legal Status and Functions of the General Accounting Office of the National Government. Baltimore: Johns Hopkins Press. 1927. pp. 193. $3.00. (Institute for Government Research.)

Wright, Stanley F. China. The Maritime Customs, II. Special Series: No. 41. The Collection and Disposal of the Customs Revenue since the Revolution of 1911. Shanghai: 1927. pp. 276. $5.00 (silver). (Second edition, revised and enlarged.)

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